# GCE Advanced Level Results in Fundamental Science Disciplines and Students' Academic Performance in Medical Schools in Cameroon

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**ABSTRACT**

*Most nations in the world are striving to have competent and reliable health sectors which will serve as one of the guarantors of ensuring sustainable growth and development. One major means of achieving this is through the application of advanced selection mechanisms of students into medical schools. Students most often are selected based on their previous academic performance in the science subjects in high school. This study thus, set out to ascertain the extent to which the grades scored in Biology, Chemistry and Physics in the GCE A/L predict students' academic performance in medical schools in Cameroon and the extent to which the grades scored in GCE A/L Biology, Chemistry and Physics motivate students to study medicine. The correlation survey research design was used to carry out the study. The sample population used for the study were students with GCE A/L background in three state medical schools in Cameroon namely; the medical schools of the Universities of Bamenda, Buea and Yaounde 1, selected through the judgmental sampling technique. In these medical schools, years 4, 5 and 6 were also selected using the judgmental sampling technique, so that the students' results in the 1st,2nd and 3rd years could be used for the study. The simple random sampling technique was used to select 200 medical students from the prior sampled levels. A questionnaire made up of 32 items was used to collect data from the students. The hypotheses were tested at the 0.05 level of significance using bivariate linear regression analysis through SPSS version 20.0. The results revealed that the grade scored in GCE A/L Biology insignificantly predicted students' academic performance in the first and second year in medical schools but predicted significantly students' academic performance in the third year. The grade scored in GCE A/L Chemistry significantly predicted students' academic performance in medical schools in the first, second and third year. The grade scored in GCE A/L Physics significantly predicted students' academic performance in the first, second and third years in medical schools. The results also revealed that GCE A/L results in Biology, Chemistry and Physics significantly motivated students to study medicine. From the findings, GCE A/L results in Chemistry and Physics and to a lower extent in Biology could logically be used to select students into medical schools and the grades scored in GCE A/L Biology, Chemistry and Physics could be used to motivate students to study medicine. Also, more weightings should be given to the grade scored in GCE A/L Physics in the selection of students into medical schools, as it discriminates best amongst the three fundamental science subjects.*

**Key words:** *GCE A/L, Fundamental science subjects, Academic performance, Medical schools*

## INTRODUCTION

In this era of globalisation and technological revolution, education is considered an important ingredient for societal growth and development. Education is a fundamental human right as well as a catalyst for economic growth and human development (Okumu, Nakajjo & Isoke, 2008). Education has also been used by many nations world wide as a limelight for economic growth. Science in particular can exert a dominant, if not decisive influence on the life of individuals as well as on the developmental effort of a nation (Emovon, 1985). The universal recognition of the above submission is responsible for the prime position given to science including medicine worldwide (Adesoji & Olatunbosun,2008). Moreover, education remains the only major avenue for upward social mobility (Amutabi,

2003). It plays a vital role in the development of human capital and is linked with an individual's wellbeing and opportunities for better living (Battle& Lewis, 2002).

The current trends of social and economic development have clearly showed that a powerful and competent health sector in each country will be quite fundamental for such development. For the health sector to be competent, entails the training of up to date and skilled medical doctors who have according to Boelen (1993) the five-star characteristics which goes beyond a care provider, to a decision maker, a communicator, a community leader and a manager. To easily train medical doctors with such qualities, advanced scrutiny has been adopted in the educational systems of most countries in order to identify prevailing predictors or determinants of a sound academic performance of students in medical schools as Gee and Cowless (1957) opined that during the past decade a great deal of attention has been directed by medical schools to the improvement of their appraisal of student applications. One of such predictors whose effect on the academic performance of medical students could be determined in order to make necessary modifications in the selection criteria of students into medical schools in Cameroon is the GCEA/L results in Biology, Chemistry and Physics (fundamental science subjects). Therefore, this study is out to determine the predictive validity of GCE Advanced Level (A/L) results in fundamental science subjects (disciplines) to students' academic performance in medical schools in Cameroon.

The admission committees into medical schools nowadays use strict and fixed measures in the selection process. Before the 19$^{th}$ Century there were no fixed criteria for the selection of students into medical schools (Ludmeyer, 1999), because of this, there was the proliferation of the medical field with doctors after eight months who could not meet the medical needs of the society (Iserson, 1997). All this led to the standardization of the medical school requirements by the year 1897. At that time, the criteria were; an English composition of not less than 200 words, Arithmetic, and one-year study of Latin. In addition to these, a high school diploma or its equivalent was required (Kyei- Blankson, 2005). By the year 1990 in the United States, interviews were introduced as part of the activities to be carried out before gaining admission into medical schools and also recommendation letters from under graduate faculties as well as undergraduate GPA and MCAT test scores were considered as part of admission criteria (Kyei-Blankson, 2005). From the yesteryears, selection and admission of students into institutions of higher learning in Cameroon have been based to some extent on end of course secondary school examination results. Medical schools which are considered highly prestigious, strive to select students of high academic aptitude basing to some extent on the students' academic performance in end of course examinations. In Cameroon, students undertaking the Anglo-Saxon sub system of education take the General Certificate of Education(GCE) examinations as end of course secondary school certificate examinations. The Cameroon GCE examinations are organised by the Cameroon GCE board. (CGCEB, 2007).

In 2013, modalities for the entrance examination into medical schools in Cameroon were drafted upon by a joint commission of the ministries of public health and higher education. It was decided by this joint commission that a single entrance examination shall be written by all the students seeking admission into the medical schools in Cameroon. (Cameroon, 2013). This examination was designed for selection of students the authorized medical schools in Cameroon which today are; the Faculty of Medicine and Biomedical sciences of the University of Yaounde, the Faculty of Health Sciences of the University of Buea, the Faculty of medicine and Pharmaceutical sciences of the university of Douala, the University of Montagnes in Bangangte, Higher institute of medical technologies Nkoloudom in Yaounde (Monekosso, 2014). In addition to this is the Medical school of the Catholic University in Cameroon located in Kumbo and the Faculties of medicine and Biomedical sciences of the universities of Dschang and Ngaoundere created by presidential decree on the 5$^{th}$ of January, 2018.

In Cameroon, Biology, Chemistry and Physics are the GCE advanced level science subjects which a student must have studied in high school before he or she could clearly have admission into the medical schools since the entrance examinations into medical schools have these 3 subjects and also because the grades scored in these subjects are used as a criterion for section into the medical schools (Cameroon, 2011). Since A/L Biology, Chemistry, and Physics have been sought necessary as good preparatory bases for a career in medicine. It is necessary to ascertain extent to which these 3 subjects predict academic performance in the medical schools in Cameroon.

## Statement of the Problem

The academic performance of students in medical schools is affected by several factors such as their previous academic performance, financial situation in school, medical school environment, age, gender, social characteristics and also the student's motivation to study medicine. Medical schools have long been concerned with establishing a suitable process of admission. The criteria used to select students havetraditionally focused on high academic achievement (Ammu, Nagarajah & Young, 2012). In the united-Kingdom, selection into medical schools is based to a large extent on the grades scored in Biology and Chemistry at the A/L. (James et al 2001). Selection into the medical schools of the USA is done through the MCAT and a review of the transcripts of the applicants in order to look for evidence of intellectual competence particularly in Biology, Chemistry and Physics in which they will like to see a pattern of A'S and B grades occasionally. Students are selected into medical schools in Cameroon based to a greater extent on their cognitive abilities in subjects like Biology, chemistry and Physics at the Advanced level, as stipulated in article 2 sub section1 of PM order No; 11/029 of 30 May 2011. This can be seen from the entrance examination in which the written papers comprising of Physics, Biology, Chemistry and General Knowledge make up 80% and a study of academic files make up 20%. This simply means that cognitive knowledge and previous academic performance are seen to be apparently stronger predictors of academic performance in medical schools in the midst of these other prevailing factors. But should that clearly be the case? Does it then mean that a student with a mastery of A/L sciences which will be reflected with the good grades he/she will score at the GCE examinations, after getting admission into a medical school will definitely continue being a top academic achiever? Even if so, is the GCE exams worth the recognition and value it is given in the selection and placement of students into medical schools? Furthermore, the written part of the entrance examinations into medical schools in Cameroon is designed in such a way that the proportions of questions covered by the science subjects (Biology, Chemistry and Physics), are not equal, thus the weightings are not equal. Does it also then mean that some science subjects are of greater importance than others in medical studies?

It is against this back drop that the researcher set out to ascertain the predictive validity of GCE. Advanced level results in fundamental science subjects to the academic performance of students in medical schools in Cameroon.

## Research Questions

### General Research Question

To what extent do the grades scored in fundamental science subjects at the GCE Advanced level predict students' academic performance in medical schools in Cameroon?

### Specific research Questions

1. To what extent does the grade scored in GCE A/L Biology predict students' academic performance in medical schools in Cameroon?
2. To what extent does the grade scored in GCE A/L Chemistry predict students' academic performance in medical schools in Cameroon?
3. To what extent does the grade scored in GCE A/L Physics predict students' academic performance in medical schools in Cameroon?
4. Do the grades scored at the GCE A/L in fundamental science subjects motivate students to study medicine?

## Objectives of the study

### General Objective

The general objective of this study is to determine the predictive validity of GCE advanced level results in fundamental sciences to students' academic performance in medical schools in Cameroon

**Specific Objectives**

1. To determine the extent to which the grade scored in GCE A/L Biology predicts students' academic performance in medical schools in Cameroon.
2. To determine the extent to which the grade scored in GCE A/L Chemistry predicts students' academic performance in medical schools in Cameroon.
3. To determine the extent to which grade scored in GCEA/L Physics predicts students' academic performance in medical schools in Cameroon.
4. To determine the extent to which the GCE A/L results in fundamental science subjects motivate students to study medicine.

**Research Hypotheses**

The following hypotheses were formulated and tested at the 0.05 level of significance to guide the study:

**$H_{O1}$**: The grade scored in GCE A/L Biology does not significantly predict academic performance in medical schools

**$H_{O2}$:** The grade scored in GCE A/L Chemistry does not significantly predict Students' academic performance in medical schools

**$H_{O3}$:** The grade scored in GCE A/L Physics does not significantly predict students' academic performance in medical schools.

**$H_{O4}$:** The grades scored at GCE A/L in fundamental science subjects do not significantly motivate students to study medicine.

## Conceptual Framework

When students are seeking admission into the high school, they chose to do subjects that will pave the way for their future careers. Students who will wish to pursue the medical career will likely study chemistry, biology and physics amongst other subjects at the advanced level. Studying these subjects will be of prime importance because these are the subjects which are assessed at the entrance examination into the medical schools of Cameroon. The entrance examinations into the medical schools in Cameroon also have an age limit and thus students above a particular age cannot sit for the entrance examination. But there is no gender discrimination as Cameroonians of both sexes can sit for and have admission into the medical schools in Cameroon. When students get admitted into medical schools, they have the uphill task to perform academically very well in order to go through the medical studies smoothly. The Advanced level results of some students could serve as a motivating factor while for others it will not.

In this study, the main independent variables are grades scored in GCE A/L Biology, Chemistry, and Physic. while Motivation measures the extent to which the fundamental science subjects motivate students to study medicine. The Academic performance at medical school is the dependent or criterion variable

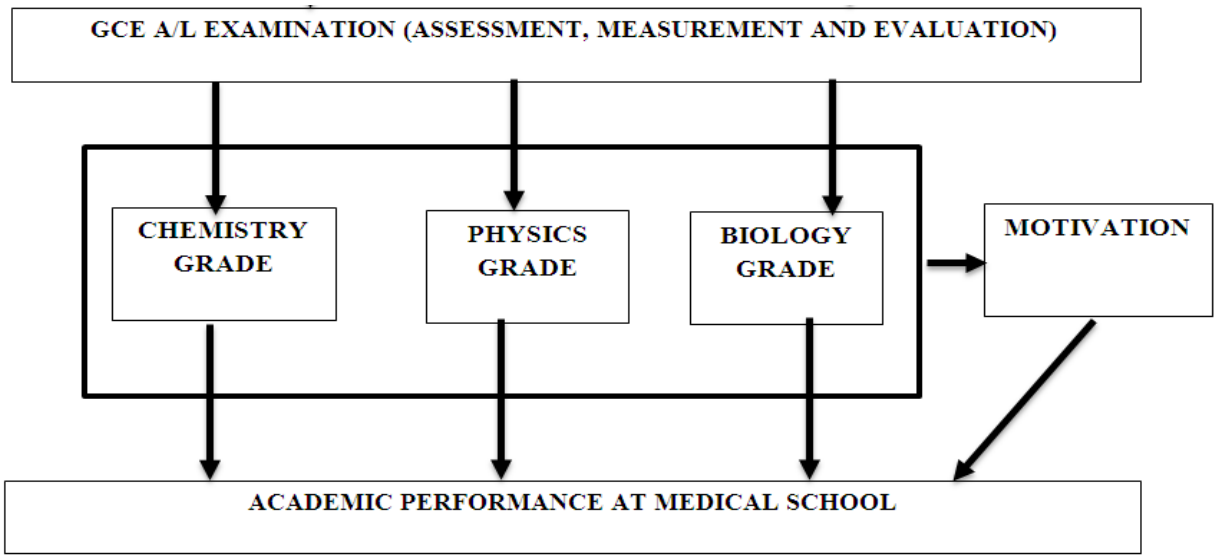


**Fig.1. Conceptual Framework**

## Empirical Review

Many research works have been carried out on determining students' performance in medical schools by their high school results. Amongst these works, the following are highlighted in this paper.

Donnon, Pauluaci and Violato, (2007), carried out a research work with the aim to conduct a meta- analysis of published studies to determine the predictive validity of the MCAT on medical school performance and medical board licencing examinations. The results revealed that for preclinical years, r = 0.39 (95% confidence interval CI, 0.21-0.54) and on the USMLE step 1 of r =0.60 (95% CI, 0.50- 0.67) and the biological sciences subset as the best predictor of medical school performance in the preclinical years (r = 0.32 95%CI, 0.21-0.42) and on the USMLE step1 (r =0.48 95% CI, 0.41-0.54).

Also, James, Yates, and Nicholson, (2010), set out to determine in a study whether the UK clinical Aptitude test (UKCAT) adds value to the selection process for school leaver applicants to medical and dental school, and in particular whether UKCAT can reduce the socioeconomic bias known to affect A levels. The results showed that the independent predictors of obtaining at least AAB at A level were white ethnicity (odds ratio 1.58,98%) confidence interval 1.41 to 1.77), professional or managerial background (1.39, 1.22 to 1.59), and independent or grammar schooling (2.26, 2.02 to 2.52) (all P< 0.001). Independent predictors of achieving UKCAT scores at or above the 30$^{th}$ centile for the whole test were male sex (odd ratio 1.48, 1.32 to 1.66), white ethnicity (2.17,1.94 to 2.43), professional or managerial background (1.34, 1.17 to 1.54), and independent or grammar schooling (1.91,1.70 to 2.14) (all P< 0.001). Socioeconomic status data were significantly different from those who provided that information, which may have caused bias in the analysis.

Khalid (2013), carried out a study on the reliability of the selection criteria used at Taibah university college of medicine, for predicting academic performance, in order to determine those that are more reliable. A retrospective cohort study was conducted on the 478 students in the first 4 years of a 6-year programme at the college of medicine between February and April 2012. The variables examined were high school grades, aptitude test scores, achievement test scores and the balanced percentage. The criterion was the college grade point average of the students at each academic level. The results showed a significant positive relation (P <0.01) was found between high school grades an achievement test scores and the college grade point average. High school grades being most predictive. No significant relation was found with aptitude test scores.

Dong, Sunget and Duning (2015) carried out a research to determine the effect of MCAT scores on medical school performance amongst 340 students who graduated in 2010 and 2011 from the uniformed services university (USU) of the health sciences of the USA. The results indicated that each iteration of the MCAT score was weakly

associated with first year cumulative GPA, 2nd year Cumulative GPA, 3rd year clerkship GPA and 4th year clinical GPA.

Faisal and Ahmed (2013), carried out a study in the college of medicine in the Arabian gulf university to determine the possibility of early prediction of non-suitable students who may not be able to consummate their medical course and to investigate the extent to which the pre-admission tools an MCAT sub-scores predict the overall students' academic performance. The results showed that the student attrition rate is 12%, which is higher than reported values. It was also found that the AGU-MCAT English test, and high school grades can predict students' performance in year 1 ($R^2$ = 37.6%) while AGU-MCAT science test had a moderate effect ($R^2$ = 21.2%). The year 1AGPApredicted students' performance at the Bsc ($R^2$ = 54.9%). The interview part of the AGU-MCAT and the BSc scores are paramount to the students' performance in the clerkship phase. In the MD phase, the major predictor was the Bsc scores ($R^2$ = 77.6%), while high school grades, high school science grades and the AGU-MCAT had very little effect.

Ammu, Nagarajah and Young (2012) also set out to determine the influence of admission qualification on the performance of first and second year medical students at the international medical university. 1281 students were used in the study and they were students admitted between December 1993 and march2000 into the IMU medical program. The relationship between the five groups of pre-university entry qualifications and the students' academic achievement in 3 end of year semester (EOS) examination namely; EOS1, EOS3, EOS5 were analysed. The data was analysed using one-way ANOVA and chi-square statistics. The results indicated that students with better performance in their EOS examination regardless of the science subject that they took at the pre-university level.

## Appraisal of Literature

From the above empirical studies, it is evident that research has considerably been done on the effect of pre-admission measures such as previous academic performance, age, gender and motivation on students' academic performance in medical schools. Previous academic performance such as MCAT scores, JAMB results have been correlated in some studies to students' academic performance at medical school, but very little has been done in relation to correlating GCE results to students' academic performance at medical school, and in the Cameroonian context, it is quite a new field of research and thus the researcher in this study sought to determine the predictive validity of GCE A level results to students' academic performance in medical schools in Cameroon.

## Research Methodology

This study made use of the correlation survey research design. This study was carried out in Cameroon and specifically in the medical schools of the universities of Yaounde 1, Buea and Bamenda. The target population of this study encompasses the total number of medical students in all the medical schools in Cameroon with GCE Advanced level background. The sample population comprised of all the medical students with GCE A/L background in the medical schools of the universities of Bamenda, Buea and Yaounde 1. It is from this sample population that the sample of the study was drawn.

The sample of this study was 200 medical students. The sample for this study was obtained through some sampling techniques. Firstly, the judgemental sampling technique was used to select the medical schools used for this study. This sampling technique was used to select medical schools where there is a good number of medical students with GCE Advanced level background. Consequently, the medical schools of the universities of Bamenda, Buea and Yaounde 1 were selected for the study. The judgemental or purposive sampling technique was also used to select the levels to be used for the study in each of the three sampled medical schools. Levels 4,5 and 6 were selected because students of this level have completed their preclinical studies, that is studies of the first three levels, since the study was to make use of students' results of levels 1,2 and 3. Students of level 7 were not selected because they were in their final year of study and thus were rounding up with academic aspects like their end of course projects amongst others. The simple random sampling technique was used to randomly select students from each of the sampled levels in the sampled medical schools. The simple random sampling technique was done as follows; Small pieces of papers were cut and folded, and the number cut and folded corresponded to the number of students in each class or

level of study. The number of folded papers corresponding to the number of the students to be sampled in each class or level had the inscription "student" on it and the others were left empty. The folded papers were then put in a bag and each student was asked to pick up a folded paper and open. Those whose papers had the inscription "student" were asked to answer the questionnaire. Below is a table indicating the number of levels 4, 5 and 6 students with the GCE A/L background sampled and used for this study

**Table 1**

**Accessible and sample population**

| Medical school | No of level 4 | No of level 5 | No of level 6 | Sample of level 4 | Sample of level 5 | Sample of level 6 | Total of sample |
|---|---|---|---|---|---|---|---|
| **FMBS UY1** | 16 | 17 | 19 | 10 | 10 | 10 | 30 |
| **FHS UB** | 35 | 32 | 29 | 30 | 29 | 26 | 85 |
| **FHS UBa** | 25 | 40 | 36 | 19 | 35 | 31 | 85 |
| **TOTAL** | **76** | **89** | **84** | **59** | **74** | **67** | **200** |

The instrument used for data collection was a questionnaire for students. The data was analysed using SPSS version 20.0. Two statistical tests were used to analyse the data in order to provide answers to all the research questions. The bivariate linear regression analysis was used to test the hypotheses and consequently to provide answers to the four research questions.

## Instrument used for data collection

The instrument used for data collection was a questionnaire for students. The questionnaire was comprised of four sections. Section A contains mainly questions on personal or demographic information. Section B contains questions measuring the extent to which GCE A/L results motivates students to study medicine. The students while answering questions in section B were required to choose from one of the ten options of the likert scale ranging from Strongly Disagree(SD), Somewhat Disagree (SWD), Somewhat Agree (SWA) and (SA). Section C was designed to get information on the grades students scored in Biology, Chemistry and Physics at the GCE A/L and Section D measured students' academic performance in the first, second and third year at medical school from their grade point averages (GPA).

### Validation of the Instrument

To ensure content validity, the questionnaire was read and corrected by the co-supervisor to avoid ambiguity and to ensure that all the research questions and hypothesis were considered in the development of the questionnaire. The questionnaire was then handed to the supervisor for final correction and approval. After the supervisor corrected and approved the questionnaire, it was later given to three content specialists for review and for them to judge and ascertain the validity of each item on the questionnaire. From their judgements given, the validity of each item was then derived and consequently the content validity index (CVI) was calculated using the formula;

$$\mathbf{CVI} = \frac{\textbf{No of judges who declared item valid}}{\textbf{Total No of judges}}$$

and it gave a value of CVI = 0.84.

Since the CVI value was greater than 0.7 (i.e. CVI = 0.84 > 0.7), it therefore means that the questionnaire is of appropriate content validity.

Face validity was ensured by peer review. That is, the questionnaire was viewed by some peers for them to confirm whether the questionnaire from face look appears to be what it is supposed to be.

**Reliability of the instrument**

The reliability of the instrument refers to the extent to which the instrument is stable, dependable and consistent in measuring what it is supposed to measure.

The reliability of the questionnaire was ensured using the split half reliability method. The questionnaire was administered to 20 students of the third year of the medical school of the University of Bamenda. The questionnaire measuring the psychological variable was divided into two comparable halves or subsets, with all the odd items on one half and the even items on the other half. Each subject's score on the two halves were then computed and then correlated. The Spearman Brown prophecy formula was later applied to get the actual reliability coefficient, that is $r_{xx} = 2r'_{xx} / 1+ r'_{xx}$

Where

$r'_{xx}$= the correlation between the two halves

$r_{xx}$= split half reliability coefficient

$r'_{xx}$= 0.6

Therefore, $r_{xx} = 2(0.6) / 1+ 0.6 = 0.8$

The split half reliability coefficient had a value of $r_{xy}$=0.8 which indicates that there is a relatively high internal consistency amongst the questionnaire measuring the psychological construct.

## Method of data collection

To be able to collect data, the researcher first obtained a research permit from the Faculty of Arts, signed by the Dean of the Faculty. This enabled the researcher to gain access to the various medical schools. Consequently, the researcher got the cooperation of the administrative authorities alongside lecturers and students of the medical schools, who helped in the administration and collection of the questionnaire.

## Method of data analyses

The data was analysed using SPSS version 20.0. Two statistical tests were used to analyse the data in order to provide answers to all the research questions. The bivariate linear regression analysis was used to test the hypotheses and consequently to provide answers to the four research questions.

**Table 2**

**Summary of findings**

| VARIABLE | Year of study | $R^2$ | Adjusted $R^2$ | Df | F-Stat | significance |
|---|---|---|---|---|---|---|
| **Biology** | 1st | 0.012 | 0.007 | (1,198) | 2.42 | 0.12 |
| | 2nd | 0.019 | 0.014 | (1,198) | 3.83 | 0.52 |
| | 3rd | 0.042 | 0.038 | (1,198) | 8.79 | 0.00 |
| **Chemistry** | 1st | 0.041 | 0.037 | (1,198) | 8.56 | 0.00 |
| | 2nd | 0.052 | 0.047 | (1,198) | 10.79 | 0.00 |
| | 3rd | 0.068 | 0.063 | (1,198) | 14.45 | 0.00 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Physics** | 1st | 0.11 | 0.10 | (1,198) | 23.61 | 0.00 |
| | 2nd | 0.08 | 0.07 | (1,198) | 16.99 | 0.00 |
| | 3rd | 0.51 | 0.05 | (1,198) | 10.69 | 0.00 |
| **GCE A/L as motivation** | | 0.11 | 0.11 | (3,196) | 8.12 | 0.00 |

## Discussion of findings

**The grade scored in GCE A/L Biology, Chemistry and Physics and Academic Performance at Medical School.**

From the analysis carried out in the study using bivariate linear regression analysis through SPSS version 20.0, the results showed that GCE A/L Biology insignificantly predicts students' academic performance in the first and second years at medical schools in Cameroon, but predicts significantly students' academic performance in the third year at medical school. It predicts insignificantly students' academic performance in the first year at medical school with F (1, 198) =2.42, $p$=0.12. and having a linear correlation coefficient of 0.012, indicating that 1.2% of the variance of students' academic performance in the first year at medical schools could be accounted for by the grade scored in Biology at the GCE A/L. The value of $p$= 0.12 means that A/L Biology is insignificant at the 0.05 level of significance. GCE A/L Biology insignificantly predict students' academic performance in the second year at medical school with F(1,198) =3.83, $p$=0.52 and has a linear correlation coefficient of 0.019, indicating that 1.9% of the variance of students' academic performance in the second year in medical schools could be accounted for by the grade scored in A/L Biology.

GCE A/L Biology instead in the third year in medical schools significantly predict students' academic performance with F (1,198) = 8.79, $p$=0.00, and has a bivariate linear correlation coefficient of 0.042 indicating that 4.2% of the variance of students' academic performance in the third year in medical schools. Having significance of 0.00 means it is very significant at the 0.01 level of significance. This therefore means that GCE A/L Biology is not a significant predictor of students' academic performance in the first and second year at medical school, but a significant predictor in the third year at medical schools. That is students who score good grade at the GCE A/L are likely to perform relatively academically well in the third year compared to the first and second year at medical schools. It thus implies that GCE A/L Biology is not a very good preparatory base for medical studies especially in the first and second years of medical studies. From this study, since this subject has a significant predictive validity only in the third year amidst the first three years, it therefore means that the planning, setting, organization, administration, measurement and evaluation practices together with the syllabus coverage inclusive could be considered modified. Therefore, the use of the grade scored in A/L Biology as a criterion for selection into medical schools could not be considered valid and reliable.

Also, the bivariate linear regression analysis carried out using SPSS version 20.0, carried out with the grade scored in GCE A/L Chemistry and academic performance at medical school, revealed that there is a significant bivariate linear relationship between the grade scored in GCE A/L Chemistry and students' academic performance in the first, second and third year in medical schools in Cameroon. It predicts significantly students' academic performance in the first year in medical schools with F (1, 198) =8.56, P=0.004 and having a bivariate linear correlation coefficient of 0.041 indicating that 4.1% of variance in students' academic performance in the first year in medical schools could be accounted for by the grade scored in GCE A/L chemistry. This means that this subject is significant at the 0.01 level of significance. Students' academic performance in the second year in medical schools is significantly predicted by the grade scores in GCE A/L Chemistry with F (1,198) =10.79, P=0.001. Which means it is significant at the 0.01 level of significance. It also predicts significantly students' academic performance in medical schools in the third year with F (1,198) = 14.45, P=0.001, Which means it is also significant at the 0.01 level of significance. GCE A/L Chemistry being a significant predictor to students' academic performance in medical schools in the first, second and third years means it could serve also as a good foundation for medical studies. Therefore, the grades scored in GCE A/L Chemistry could comfortably be used for the selection of would be medical doctors into medical schools, since it can significantly predict student' academic performance in medical schools.

The data collected to determine the predictive validity of GCE A/L Physics results to students' academic performance in the first, second and third years in medical schools in Cameroon was analyzed using bivariate linear regression analysis through SPSS version 20.0. The results showed that GCE A/L results in Physics significantly predicts students' academic performance in the first year in medical schools in Cameroon, having F (1, 198) =23.61, P=0.001. With a linear correlation coefficient of 0.11, meaning 11% of the variance in students' academic performance in the first year in medical schools can be accounted for by the grades they score in A/L Physics. , thus GCE A/L Physics results also significantly predict students' academic performance in the second year in medical schools with F(1,198)=16.99, P= 0.001 and has a linear correlation coefficient of 0.08 meaning it explains 8% of the variance of students' academic performance in the second year in medical schools. The grade scored in GCE A/L Physics also significantly predict students' academic performance in the third year in medical schools in Cameroon F (1,198) =10.69, P=0.001 and has a bivariate linear coefficient of 0.51, meaning it can account for 51% of the variability of students' academic performance in the third year at medical school. The GCE A/L results in Physics is a significant predictor of students' academic performance in the first, second and third years in medical schools, and it is significant to these three years at the 0.01 level of significance.

Having a look at the theory of attribution, it therefore means that students who attribute their success in the GCE A/L to controllable factors such as hard work, will definitely work hard after their A/L in medical schools and thus their A/L results will definitely predict their academic performance at medical school and therefore it goes in line with the finding that the GCE A/L results in Chemistry and Physics predict significantly students' academic performance in the first, second and third year of medical studies and GCE A/L Biology results predict students' academic performance in the third year at medical school, though it does not significantly predict students' academic performance in the first two years of medical studies.

The findings of this research work can also be anchored on the theory of self-efficacy. That is, students who score high grades in GCE A/L Physics and Chemistry are more likely to develop high self-esteem and thus will be confident in themselves that they could perform considerably well at medical school and so, this motivates them intrinsically and thus, they will perform academically well at medical school. Moreover, according to the theory of connectionism by Edward Thorndike, GCE A/L Physics and Chemistry are better stimulus to students' academic performance in medical schools than GCE A/L Biology.

These findings are in accordance with those of Khalid (2013), whose results showed a significant positive relation ($p$<0.01) was found between high school grades an achievement test scores and the college grade point average with High school grades being most predictive. Moreover, these findings also corroborate with the findings of the research work by Bush (2012), which revealed that prior academic achievement was the most important predictor of performance in the MPharm program. These findings are also in concurrence with those of Donald *et al* (1968), whose findings showed significant correlations were observed between both pre-medical years completed at the time of application, overall pre-medical grade average and "science" MCAT score. The findings of this study also matched those of Dong et al (2015) whose findings indicated that each iteration of the MCAT score was weakly associated with first year cumulative GPA, 2nd year Cumulative GPA, 3rd year clerkship GPA and 4th year clinical GPA.

Amongst the three GCE A/L subjects Biology, Chemistry and Physics, Physics is the most predictive to students' academic performance in medical schools in the first second and third year and are all significant at the 0.01 level of significance, which means it is significant at the 1% confidence interval and accounts for the highest variability amongst the three subjects of students' academic performance at medical school. The next subject in terms of predicting students' academic performance in medical schools is Chemistry, which significantly predict students' academic performance in the first three years of medical school. While GCE A/L Biology predicts least students' academic performance at medical school as it predicts significantly students' academic performance in the third year, but does not predict students' academic performance in the first and second years of medical studies. This finding was contrary to those of Donnon et al (2007) who found out that the biological science sub set was the best predictor to students' academic performance in pre-clinical years.

**GCE A/L Results in Fundamental Science Subjects and Students Motivation to Study Medicine.**

From the analysis carried out using multiple linear regression with one set of predictors through SPSS version 20.0, to determine the extent to which the grade scored in Biology, Chemistry and Physics motivate students to study

medicine. GCE A/L in fundamental science subjects (Biology, Chemistry and Physics) was a significant predictor of students' motivation to study medicine. F3, 196) =8.16, $p<0.01$. Also, 11% of the variability in the students' motivation to study medicine could be predicted from grades scored at the GCE A/L in fundamental science subjects.

All the bivariate correlations between the grades scored in fundamental science subjects and students motivation to study medicine was positive and significant ($p<0.01$). Only the partial correlation between grade scored in Physics and students' motivation to study medicine was significant. On the basis of this correlation analysis, it is tempting to conclude that the only useful predictor is the grade scored in A/L Physics it alone accounts for 8.41% of the variance in motivation to study medicine, while the other variables contribute only 2.59% of the total variability of 11%. Because the predictors are correlated, judgment about their relative importance becomes difficult. The correlation among the grades scored in fundamental science ranges from 0.18 to 0.29. The grades thus scored in the fundamental science subjects at the GCE A/L significantly motivate students to study medicine. This finding is in accordance with the theory of self-efficacy. That is the GCE A/L results in Biology, Chemistry and Physics considerably motivated students to belief that they can successfully study medicine. The findings of this study corroborate with those of (Kourosh *et al*, 2011) and Hassan *et al* (2010)

## Conclusion

The findings of this study which was out to determine the extent to which GCE A/L results in fundamental science subjects predict students' performance in medical schools in Cameroon were quite pertinent. Summarily, GCE A/L Chemistry and Physics significantly predict students' academic performance in the first, second and third year in medical schools in Cameroon, while GCE A/L Biology predicts students' academic performance significantly only in the third year with the best predictor amongst the three subjects being Physics, followed by chemistry and lastly by Biology. This order of prediction amongst these three subjects is quite surprising, taking into consideration the fact that the entrance examination which is used for the selection of students into medical schools in Cameroon is designed in such a way that Biology instead has the greatest proportion of questions, followed by Chemistry and Physics has the least number of questions. This in turn means that knowledge in GCE A/L Biology is more assessed than those of Chemistry and Physics, but contrarily the results of this study showed that GCE A/L physics predicts better than Chemistry which in turn predicts better than Biology thus if GCE A/L results are to be used for placement into medical schools, the grade scored in Physics should be given the highest priority, followed by that of Chemistry and lastly by that of Biology. Furthermore, it is important to note that the higher the grades scored in these subjects at the GCE A/L, the higher their motivation of studying medicine

## Recommendations

1) From the findings, GCE A/L results in Chemistry and Physics and to a lower extent in Biology should be used to select students into medical schools in Cameroon

2) More emphasize should be laid on the knowledge students have in GCE A/L Physics and Chemistry in the selection of students into medical schools in Cameroon by increasing the number of physics and chemistry questions and thus the weightings of these subjects in the entrance examination into these medical schools.

3) The Cameroon GCE board should fine tune the setting and vetting of GCE A/L Biology examinations in order to improve upon its quality and make it more reliable and dependable in predicting future academic performance.

4) The synergy between the ministry of secondary education and the medical schools should be improved upon in order to better prepare a good transition for students from secondary schools to medical schools.

## Suggestion for further studies

1) Further studies should be done to determine the effect of GCE A/L Mathematics and Further mathematics on students' academic performance in medical schools.

2) Research should also be done to determine the effect of other factors such as parental factors and socioeconomic factors on students' academic performance in medical schools.

3) Research should also be carried out to determine the extent to which students' motivation to study medicine affect students' academic performance in the clinical years of medical studies

4) More research should be done to determine the effect of GCE A/L results in fundamental science subjects to students' academic performance in the clinical years of medical studies.

5) Finally, research should be done to determine the extent to which GCE A/L results in the sciences predict students' academic performance in the various branches of engineering in schools of engineering.

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