

# Validity of Utme and Post-Utme in Predicting Students' Academic Achievement in Undergraduate Mathematics

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## ABSTRACT

Some Mathematics undergraduate students who reckoned high grades in SSCE Mathematics, high scores in UTME and Post-UTME Mathematics end up spending extra years in the university, some graduating with low class of degrees and some others dropping out of school. Hence, the need for this study which was specifically aimed at determining students' UTME scores in Mathematics, and Post-UTME scores in Mathematics as correlates of the first year mean achievement scores of the students in undergraduate Mathematics. The design of the study was correlational survey research design. The study was guided by three research questions, and three hypotheses. The study was carried out in Ebonyi State. The study used a sample of 120 students out of the total population of 146 students drawn from the 2018/2019, 2019/2020, and 2020/2021 academic sessions in both the Pure and Applied Mathematics and Mathematics Education courses using both purposive sampling and proportionate random sampling techniques. The data were collected using a researchers-made instrument which was face validated by three experts, one in Measurement and Evaluation; and two experts in Mathematics Education all in Department of Science Education. The data were analyzed using Pearson Product Moment correlation, Regression Analysis and Analysis of Variance. The research questions were answered using the Pearson Product Moment correlation coefficients, while all the hypotheses were tested at 0.05 level of significance, using exact probability approach. The findings of the study showed that students' UTME and Post-UTME scores in Mathematics significantly positively correlated with the first year mean achievement scores of the students in undergraduate Mathematics. Hence, the researchers concluded that both UTME and Post-UTME scores in Mathematics are reliable predictors of the students' academic achievement in undergraduate Mathematics.

**Keywords:** Utme, Post-Utme, Mathematics, Students' Achievement, Undergraduate.

## INTRODUCTION

In Nigeria, examination in schools is as old as western education itself. Since the beginning of Western Education in Nigeria by the missionaries in 1842, examination has been one of the major instruments for assessing and determining the students' academic achievement in various fields of learning including Mathematics. Mathematics is one of the compulsory subjects offered at both Basic and Post-Basic Education levels in Nigeria. Mathematics can be defined as a science that studies numbers, space, shapes, quantities, measurements and their relationships using special notations (Ituma, 2021). The branches of Mathematics include arithmetic, algebra, geometry, trigonometry, calculus and statistics. There are two facts of Mathematics in general: its structure or algorithms (rules, order, trends, constants, theorems, etc) and its functions (i.e. the uses we put Mathematics into such as in computing, commerce and trade, accounting, communication, information, technology and so on). Mathematics is the bedrock of science and technology because the structure, development and methods of science and technology are mainly anchored in Mathematics. Ladipo (2017) opined that Mathematics is at the base of every effort to develop society and hardly any progress can be made without the application of Mathematics. Ladipo added that, nations that have given attention to Mathematics and its study are conspicuous by their competitive standing.

Generally, the minimum qualification or the pre-requisite for seeking for admission into any university in

Nigeria is the possession of five (5) credit passes in the relevant subjects including English Language and Mathematics in the Senior School Certificate Examination (SSCE). In Ebonyi State University (EBSU) Abakaliki and Alex Ekwueme Federal University Ndufu Alike Ikwo (AE-FUNAI) where this study was carried out, the number of candidates who sought for admission to study Pure and Applied Mathematics has been within the range of 20 to 40 candidates. For Mathematics Education, the number of candidates has been within the range of 7 to 15 candidates. In addition, the candidates must seat for and attain a high score (at least the cut off mark) in the Unified Tertiary Matriculation Examination (UTME) conducted by the Joint Admissions Matriculation Board (JAMB). Whereas the general cut-off mark provided by JAMB has always been from 160 to 200 as the case may be, various universities and departments are given the opportunity to determine their own course cut-off marks for admissions. Also, the same candidates are also subjected to screening examinations conducted by the various universities of their choice. This screening examination is known as Post Unified Tertiary Matriculation Examination (Post-UTME). These two examinations (UTME and Post-UTME) must be written by each candidate and the average score of the examinations calculated. The student is required to pass and reach the basic university cut-off mark before the candidate can be admitted into the university to study any course. Every department is given opportunity to decide what their departmental cut-off mark will be. Some candidates may score very high in UTME and Post-UTME but may be having low scores and even may even fail many of the courses in undergraduate year one courses when admitted. This can even frustrate some of them out of the school. People then wonders why the high scores gotten in the qualifying examinations is not maintained in their undergraduate courses or even increase the standard. Does it mean that the scores in the two qualifying examinations cannot predict their first year undergraduate examination scores in their Mathematics courses? This becomes the worry of the researchers and hence the reason for the study.

### **Statement of the Problem**

Some of our undergraduate Mathematics students who reckoned high grades in SSCE Mathematics, high scores in UTME and Post-UTME Mathematics end up spending extra years in the university, some graduating with low class of degrees and many dropping out of school. Some of these students also apply for change of courses after being admitted whereas some are placed on probation or withdrawn after taking the first year examinations in the universities especially in Mathematics and Mathematics related courses. Each of these students possessed the minimum qualification(s) required for admission into the Nigerian institutions of higher learning. Any candidate meeting up with the admission requirements into any tertiary institution in Nigeria and being successfully admitted into any course of study in the university as a student presupposes that the student possesses the cognitive entry characteristics or the prerequisites that will make the student perform very well in the student's course of study. However, this has not always been the case as the total students' enrolment in first year Mathematics courses may not always be the number that will continue to second year Mathematics due to many carry-over courses they may have after first year. Consequently, some may change degree or even withdraw totally from the university. Therefore, there is need to determine the validity of UTME and Post-UTME students' scores in predicting the academic achievement of students in undergraduate Mathematics.

### **Purpose of the Study**

The general purpose of this study was to determine the validity of UTME and Post-UTME students' Mathematics scores in predicting the students' academic achievement in undergraduate Mathematics. The students' Mathematics scores in both UTME and Post UTME are within the range of 0 to 100 for each of the examinations. Specifically, this study sought to determine the:

1. relationship between students' UTME scores in Mathematics and the first year mean achievement scores of the students in undergraduate Mathematics.
2. relationship between students' Post-UTME scores in Mathematics and the first year mean achievement scores of the students in undergraduate Mathematics.

3. joint multiple relationship between the predictor variables (i.e. students' UTME and Post-UTME scores in Mathematics) and the dependent variable (i.e. the first year mean achievement scores of the students in undergraduate Mathematics).

## Research Questions

The study was guided by the following research questions:

1. what relationship exists between students' UTME scores in Mathematics and the first year mean achievement scores of the students in undergraduate Mathematics?
2. what is the relationship between students' Post-UTME scores in Mathematics and the first year mean achievement scores of the students in undergraduate Mathematics?
3. what is the joint multiple relationship between the predictor variables (i.e. students' UTME and Post-UTME scores in Mathematics) and the dependent variable (i.e. the first year mean achievement scores of the students in undergraduate Mathematics)

## Hypotheses

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

$H_{01}$ : There is no significant relationship between students' UTME scores in Mathematics and the first year mean achievement scores of the students in undergraduate Mathematics.

$H_{02}$ : There is no significant relationship between students' Post-UTME scores in Mathematics and the first year mean achievement scores of the students in undergraduate Mathematics.

$H_{03}$ : There is no significant joint multiple relationship between the predictor variables (i.e. students' UTME and Post-UTME scores in Mathematics) and the dependent variable (i.e. the first year mean achievement scores of the students in undergraduate Mathematics)

## METHOD

The design of the study was correlational survey research design. The study was carried out in Ebonyi State using the two universities namely, Ebonyi State University (EBSU) Abakaliki and Alex Ekwueme Federal University Ndufu Alike Ikwo (AE-FUNAI). The study used a sample of 120 students out of the total population of 146 students drawn from the 2017/2018, 2018/2019, and 2019/2020 academic sessions in both the Pure and Applied Mathematics courses and Mathematics Education courses using both purposive sampling and proportionate random sampling techniques. The data were collected using the researchers-made instrument titled "Entry Characteristics and Academic Achievement Proforma". The instrument was face validated by three specialists in Measurement and Evaluation and one in Mathematics Education. A checklist was used to ensure that it was only those who met the required criteria were included in the study. The data were analyzed using Pearson Product Moment correlation and Regression Analysis. The value of the Pearson Product Moment correlation coefficient ranges from -1 to +1 with positive value indicating direct relationship and negative value indicating inverse relationship. A correlation coefficient of zero (0) indicates that there is no relationship between the variables under study. The research questions i and ii were answered using the Pearson Product Moment correlation coefficients, while research question iii was answered using Regression Analysis. Whereas, all the hypotheses were tested at 0.05 levels of significance using exact probability approach.

## RESULTS

The data were analyzed and the results of the study are hereunder presented in tables in accordance with the research questions and hypotheses guiding the study.

### Research Question 1

What relationship exists between students' UTME scores in Mathematics and the first year mean achievement scores of the students in undergraduate Mathematics?

**Table 1: A Correlation Table Showing the Relationship between Students' UTME Scores in Mathematics and the First Year Mean Achievement Scores of the Students in Undergraduate Mathematics**

Variables	X	SD	N	r	r <sup>2</sup>	sig.	Decision
UTME Scores in Mathematics	51.02	6.75	120	0.554	0.307	.000	Rejected
Mean Achievement Scores	56.91	11.94	120				

$p < .05$ ,  $r^2$  = Coefficient of determination

The result in **Table 1** above shows a correlation coefficient of .554 (i.e.  $r = .554$ ) and a coefficient of determination of .307 (i.e.  $r^2 = .307$ ). Hence, there is a moderate positive relationship between the students' UTME scores in Mathematics and the first year mean achievement scores of the students in undergraduate Mathematics courses. Also, the students' UTME scores in Mathematics accounted for 30.7% of the total variations in the students' achievement in undergraduate Mathematics.

### Hypothesis One

$H_{o1}$ : There is no significant relationship between students' UTME scores in Mathematics and the first year mean achievement scores of the students in undergraduate Mathematics.

The result in **Table 1** above also shows an obtained significant value of .000 for the relationship between the students' UTME scores in Mathematics and the students' first year mean achievement scores in undergraduate Mathematics courses.

This is against the a priori probability of 0.05 level of significance.

Hence, since the obtained exact probability of .000 is less than the a priori probability of 0.05 level of significance, the hypothesis one ( $H_{o1}$ ) above is rejected.

Therefore, there is a significant relationship between the students' UTME scores in Mathematics and the first year mean achievement scores of the students in undergraduate Mathematics courses.

### Research Question 2

What is the relationship between students' Post-UTME scores in Mathematics and the first year mean achievement scores of the students in undergraduate Mathematics?

**Table 2: A correlation table showing the relationship between students' Post-UTME scores in Mathematics and the first year mean achievement scores of the students in undergraduate Mathematics**

Variables	X	SD	N	r	r <sup>2</sup>	sig.	Decision
PUTME Scores in Mathematics	46.53	8.99	120	.407	.166	.000	Rejected
Mean Achievement Scores	56.91	11.94	120				

$p < .05$ ,  $r^2$  = Coefficient of determination

The result in **Table 2** above shows a correlation coefficient ( $r$ ) of .407 (i.e.  $r = .407$ ) between the students' Post-UTME scores in Mathematics and the first year mean achievement scores of the students in undergraduate Mathematics courses. The Table also shows a coefficient of determination ( $r^2$ ) of .166 (i.e.  $r^2 = .166$ ) between the students' Post-UTME scores in Mathematics and the mean achievement scores of the students in first year undergraduate Mathematics. Hence, there is a moderate positive relationship between the students' Post-UTME scores in Mathematics and the first year mean achievement scores of the students in undergraduate Mathematics. Also, the students' Post-UTME scores in Mathematics accounted for 16.6% of the total variations in the students' achievement in undergraduate Mathematics.

### Hypothesis Two

$H_{02}$ : There is no significant relationship between students' Post-UTME scores in Mathematics and the first year mean achievement scores of the students in undergraduate Mathematics.

The result in **Table 2** above also shows an obtained significant value of .000 for the relationship between students' Post-UTME Mathematics scores and the students' first year mean achievement scores in undergraduate Mathematics courses. This is against the a priori probability of 0.05 level of significance. Hence, since the obtained exact probability of .000 is less than the a priori probability of 0.05 level of significance, the hypothesis two ( $H_{02}$ ) above is rejected. Therefore, there is a significant relationship between the students' Post-UTME scores in Mathematics and the first year mean achievement scores of the students in undergraduate Mathematics courses.

### Research Question 3

What is the joint multiple relationship between the predictor variables (i.e. students' UTME and Post-UTME scores in Mathematics) and the dependent variable (i.e. the first year mean achievement scores of the students in undergraduate Mathematics)

**Table 3: A correlation table showing the joint multiple correlation R between the predictor variables (i.e students' UTME and Post-UTME scores in Mathematics) and the first year mean achievement scores of the students in undergraduate Mathematics**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.598	.357	.346	9.656

a. Predictors: (Constant), PUTME Score in Maths, UTME Score in Maths

The result in **Table 3** above shows a multiple correlation coefficient  $R$  of .598 (i.e.  $R = .598$ ) between the predictor variables (i.e. students' UTME and Post-UTME scores in Mathematics) and the dependent variable (i.e. first year mean achievement scores of the students in undergraduate Mathematics) and a coefficient of determination  $R^2$  of .357 (i.e.  $R^2 = .357$ ). Hence, following the Downie and Heath (1975)'s 3-way guide for the interpretation of the correlation coefficient  $r$ , there is a moderate positive relationship between the predictor variables and the dependent variable. Also, the predictor variables jointly accounted for 35.7% of the total variations in the students' achievement in undergraduate Mathematics.

### Hypothesis Three

$H_{03}$ : There is no significant joint multiple relationships between the predictor variables and the dependent variable.

**Table 4: A Table showing the significance or otherwise of the multiple correlation coefficient (R)**

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	6067.951	2	3033.975	32.543	.000
	Residual	10908.041	117	93.231		
	Total	16975.992	119			

a. Dependent Variable: Achievement in First Year Maths

b. Predictors: (Constant), PUTME Score in Maths, UTME Score in Maths

The result in **Table 4** above shows that the multiple correlation coefficient  $R$ , between the predictor variables and the dependent variable is significant at .000. This significant value of .000 is against the a priori probability of 0.05 level of significance. Therefore, since the obtained exact probability of .000 is less than the a priori probability of 0.05 level of significance, the hypothesis 3 ( $H_{03}$ ) above is rejected. Hence, there is a significant relationship between the predictor variables (i.e. students' UTME and Post-UTME scores in Mathematics) and the dependent variable (i.e. first year mean achievement scores of the students in undergraduate Mathematics courses).

## DISCUSSION OF THE FINDINGS

In the findings of this study presented in **Table 1**, students' UTME scores in Mathematics accounted for 30.7% of the total variations in the mean achievement scores of the students in undergraduate Mathematics. The result of the study showed that UTME scores in Mathematics significantly positively correlated with the first year mean achievement scores of the students in undergraduate Mathematics courses. This means that a student that scored high in UTME also got high score in the mean achievement score of the student in undergraduate Mathematics courses. The finding of this study is in agreement with the finding of the study carried out by Osakuade (2015), in which UTME significantly correlated with the final grades of the undergraduate students. Although, Osakuade failed to establish the specific relationship between students' UTME scores in Mathematics and the achievement of the students in undergraduate Mathematics. Also, Osakuade did not explore the relationship between UTME scores and the first year CGPA of the undergraduate students. However, the findings of this study disagree with the findings of the study carried out by Obioma and Salau (2007), Farayola (2014), Okobia (2015), each of which UTME failed to correlate significantly with the first year CGPA of the undergraduate students. The reason for the disagreement could be that Obioma & Salau, Farayola, and Okobia may have carried out the studies as at the time when JAMB had not adopted the recent innovations in the conduct of UTME. Therefore, the improvement in the significant relationship between students' UTME scores in Mathematics and the first year mean achievement scores of the students in undergraduate Mathematics as in this study may be attributed to the recent innovations in the conduct of Unified Tertiary Matriculation Examination (UTME). In other words, one may say that the introduction of Computer Based Test (CBT) among other innovations by the Joint Admissions and Matriculation Board (JAMB) in the conduct of Unified Tertiary Matriculation Examinations (UTME) is a step in the right direction.

In **Table 2**, the finding showed that students' Post-UTME scores in Mathematics accounted for 16.6% of the total variations of the first year mean achievement scores of the students in undergraduate Mathematics courses. The study showed a significant positive relationship between the students' Post-UTME scores in Mathematics and the first year mean achievement scores of the students in undergraduate Mathematics courses. This implies that a student that got high score in Post-UTME will definitely score high in his /her mean achievement score in undergraduate Mathematics courses. The finding of this study agrees with the finding of the study carried out by Farayola (2014) which showed a significant relationship between Post-

UTME and Vectorial Mechanics. The finding also agrees with the finding of Oluwatayo and Fajobi (2015), which showed that there exist significant relationship between undergraduates' Post-UTME scores and the degree CGPA in Mathematics/Computer Science from 100 level to 400 level. Also, the finding of this study agrees with the finding of Okobia (2015) which revealed a significant relationship between the Institution's Selection Test (IST) scores and the students' first year CGPA. The study showed a correlation coefficient  $r = 0.144$  between the Institution Selection Test scores of the students and the first year Cumulative Grade Point Average (CGPA) in College of Education Agbor, Delta State. The correlation coefficient  $r = 0.144$  was significant at .000 against the a priori probability of  $p < .05$ . However, Okobia's study did not explore the specific relationship between the Institution's Selection Test (IST) scores in Mathematics and the students' achievement in undergraduate Mathematics. The finding of this study also agrees with the finding of the study carried out by Osakuade (2015) in which Post-UTME significantly correlated with the final grades of the undergraduate students. In all, the findings of the studies above point out to the fact that Post-UTME is a reliable examination for the selection of candidates for university programmes and therefore should not be discarded.

## CONCLUSIONS

In view of the findings and the discussion of the findings, the researchers concluded that UTME scores in Mathematics and Post-UTME scores in Mathematics are both reliable predictors of students' achievement in undergraduate Mathematics. Therefore, both the UTME conducted by the Joint Admissions and Matriculation Board and the Post-UTME conducted by the various universities and other tertiary institutions are good aptitude tests. However, students' UTME scores in Mathematics are the best single predictor of the students' academic achievement in undergraduate Mathematics. Also, the researchers concluded that the combination of students' UTME scores in Mathematics and the students' Post-UTME scores in Mathematics is a more reliable way to predict students' academic achievement in undergraduate Mathematics.

## RECOMMENDATIONS

1. In line with the findings of this study, the researchers recommend that the Federal Government of Nigeria through the National Assembly should give Post-UTME a legal backing.
2. The university authorities should come up with a more standardized and a unified way of conducting the Post-UTME with the sole objective of ensuring quality students intake for various courses of studies in the universities and not as an instrument for revenue generation or extortion.

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