

## ESTABLISHING CONSTRUCT AND CONCURRENT VALIDITY OF UNIVERSITY OF IBADAN POST-UTME ON MATHEMATICS PAPER

BY

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**Abstract**

*The study was carried out to establish a construct and concurrent validity test of Post-UTME Mathematics paper for prospective prelim students at university of Ibadan. Two research questions were drawn to guide the establishment of construct and concurrent validity test of Post-UTME Mathematics paper. It is a multiple choice objective test of four options with 100 items. A sample of 358 applicants was randomly drawn to determine the construct and concurrent validity of the test. After item analysis, the result showed that the Post-UTME Mathematics test has a high face and content validity. The test item validity was determined through the grades made in SSCE conducted by either WAEC or NECO, the score obtained in Mathematics by individual candidate in UTME conducted JAMB and the score obtained in Mathematics in Post-UTME conducted by the University of Ibadan. The SSCE results was manipulated by converting  $A1 = 87.5$ ,  $B2 = 72$ ,  $B3 = 67$ ,  $C4 = 62$ ,  $C5 = 57$ ,  $C6 = 52$ ,  $D7 = 47$  and  $E8 = 42$  in percentages to equate SSCE to scores in UTME and PUTME respectively. The test has a construct and concurrent validity coefficient of 0.623 established through the use of Pearson Product Moment Correlation tool. The test is valid and reliable for assessing student's ability and capability to gain admission in to university of Ibadan and can be used for selection in to any higher institution in Nigeria.*

**Keywords:** Construct validity, Concurrent validity, Post-UTME, Mathematics, Senior school certificate examination

**Introduction**

The difference measurements in social science research require quantification of abstracts, intangible and construct that may not be observable. However, this quantification will come in the different forms of inference. In addition, the inferences made will depend on the type of measurement. These can be observational, self-report, interview and record review. The various measurements will ultimately require measurement tools through which the values will be captured. One of the most common tasks often encountered in social science research is ascertaining the validity and reliability of a measurement tool. The researchers always wish to know if the measurement tool employed actually measures the intended research concept or construct (is it valid? or true measures?) or if the measurement tools used to quantify the variable provides provide stable or consistent responses (is it reliable? or repeatable?). As simple as this may seems, it is often omitted or just mentioned passively in the research proposal or report. This has been adduced to the dearth of skills and knowledge of validity and reliability test analysis among social and education researchers.

The Unified Tertiary Matriculation Examination (UTME) is a computer-based standardized examination for prospective undergraduates in Nigeria. It is designed to assess problem solving, critical thinking, and knowledge of scientific concepts and principles significance of each subject taken (Adamu, 2017). Prior to 2014 the exam was a paper-and-pencil test; since May 17, 2014, however, all administrations of the exam have been computer-based. Registration is usually once in a year, of which candidates are allowed to register just four Subjects. The Use of English is compulsory and any other three subjects relevant to the proposed course of study as set out in the relevant Chapters of the JAMB UTME Brochure (Obaji, 2016). JAMB prohibits the use of calculators, timers, or other electronic devices during the examination. Cellular phones are also strictly prohibited from exam rooms and individuals found to possess them are penalised, usually made to forfeit the examination. The only item that may be brought into the testing room is the candidate's Reprinted E-registration slip. UTME results are made available just few days after the examination has been conducted via JAMB's website, SMS and E-mail of individual testees. JAMB also sends scores to universities and institutions being applied to (Obi, 2016). JAMB does not prepare candidates for its examination by establishing secondary schools or tutorial centers, and no such institution is affiliated with the body. Thus UTME is called ranking test mainly for placing successful candidates into either university, colleges of education and polytechnics. However, JAMB provides a syllabus brochure, which is either made available online or given to students when they register. Candidates are expected to cover all the subject areas in the syllabus (Onyekakeyah, 2017).

JAMB also has an online practice test on its website which enables students to practice. There are also some test software and applications which are made by several test preparatory companies, none of which JAMB is affiliated with. Students also purchase UTME past questions book, which contains questions asked in the exam during

previous years. The book is made by different publishing companies. The need to ensure that competent and qualified candidates are admitted into Nigerian universities and cross-validate the scores of candidates in the Unified Tertiary Matriculation Examination (UTME) conducted by the Joint Admissions and Matriculation Board (JAMB) are some of the reasons given by public tertiary institutions to justify the introduction of post-UTME. However, controversy has continued to trail the necessity or otherwise of the screening exercise (Gong, 2016). According to Adedoyin (2021), during the interaction, the panel members were so “impressed” with her supposed results until someone from the team, probably out of curiosity, posed a simple question to her. The lady began to fidget. Initially, some of the panel members thought she was intimidated by the presence of some professors, thereby, giving her time to relax. But, alas, the candidate bungled the answer, as she later confessed that someone wrote the exams for her. With these experiences, there is debate out there, whether the post-UTME should continue or not. The Federal Government in 2005, introduced the policy of post-UTME screening by universities, which made it compulsory for tertiary institutions to test candidates after JAMB results before offering admission.

In 2017, the Nigerian senate began moves to scrap Post-UTME as it mandated its committee on tertiary education to meet with relevant stakeholders, especially JAMB to come up with recommendations on how to achieve the set goal. According to the lawmakers, the move became necessary because the introduction of post-UTME failed to remedy the problems associated with JAMB and its existence poses more challenges for tertiary education. While the policy was aimed at addressing the poor quality of students entering the university, some of the lawmakers said the test actually re-introduced and entrenched many of the problems it sought to eliminate. They also alleged that the policy, meant to be a remedy to the decay in higher institutions of learning, became an avenue of extorting prospective students. The National House of Representative, (2016) among many significant others said there was no need for other examinations to be conducted by universities after JAMB had administered the same, which it is statutorily empowered to do. Universities should not be holding another examination for prospective students. If JAMB is qualified enough to conduct Computer Based Tests (CBT), then, there should be no need to conduct another test for students to gain admission. They are also of the view that the adoption of a two-pronged qualifying examination—one conducted by JAMB and the other moderated by respective institutions was simply unfair to candidates, their parents, and guardians, describing it as a duplication of efforts.

Another school of thought agreed that post-UTME is a welcome idea for two main reasons: that through post-UTME, brilliant, indigent students have access to tertiary education as they are admitted on merit. “Any student with a 200 and above score in UTME is expected to pass post-UTME without stress. This has helped a lot. Some students with ridiculous high marks in UTME fail the screening, while some that managed to score above 200 in UTME do well in post-UTME. This provides a fair play in the process of admission seeking. Post-UTME is the saviour of those that do not engage in examinations malpractice and those with good grades but from humble backgrounds. Rather than do away with post-UTME, some educators urged the government to step up measures of improving infrastructure in public universities and expanding the same to accommodate more students that are itching for quality tertiary education. The author is of opinion that post-UTME might put serious pressure on public institutions, which do not have the capacity to cope with the rising numbers of applicants.

The researcher wondered how an institution with a capacity for less than 5,000 students per session and with over 500,000 applicants would be able to choose the best without post-UTME. Obioma & Salau (2007), said SSCE is prepared and administered by the West African Examination Council (WAEC), an organization that has operated school examinations in several West African countries. In 1989, the SSCE replaced the West African General Certificate of Education Ordinary and Advance levels. In 1999, the Nigerian government established the National Examination Council of Nigeria (NECO) to compete with the WAEC. Nigerian senior secondary school students can take either the WASSCE or the National Examination Council (NECO) exam or both. This is the examination taken by candidates in their last stage of Secondary School Education. The SSCE is in two categories. One is for candidates in the third and final year of their senior secondary education and it is called SSCE Internal while the Second is SSCE External and is for candidates not in the School system, i.e. Private Candidates. The SSCE internal has seventy-six subjects which are grouped into the following six categories as follows Viz: Compulsory Cross-Cutting Subjects, Science and Mathematics, Technology, Humanities, Business Studies and Trade/Entrepreneurship. The minimum number of subjects a candidate can sit for is eight while the maximum is nine. All Senior Secondary schools in the Federation present Candidates for the SSCE Internal (Okebukola, 1993).

Obioma & Salau (2007), said the West African Senior School Certificate Examination (WASSCE) and NECO are both standardized test in Nigeria. Students who pass the examination receive a certificate confirming their graduation from secondary education. It is administered by the West African Examinations Council (WAEC) and

NECO respectively. The academic school-leaving qualification awarded upon successful completion of the examinations is the West African Senior School Certificate and NECOSSC. Both the WASSCE NECO tests four core subjects—English, mathematics, integrated science, social studies, and three or four elective subjects (Fehintola, 2011). Evaluation of construct validity requires that the correlations of the measure be examined in regard to variables that are known to be related to the construct (purportedly measured by the instrument being evaluated or for which there are theoretical grounds for expecting it to be related). This is consistent with the multitrait-multimethod matrix (MTMM) of examining construct validity described in Mutschlechner (2005). There are other methods to evaluate construct validity besides MTMM. It can be evaluated through different forms of factor analysis, structural equation modeling (SEM), and other statistical evaluations. It is important to note that a single study does not prove construct validity. Rather it is a continuous process of evaluation, re-evaluation, refinement and development. Correlations that fit the expected pattern contribute evidence of construct validity. Construct validity is a judgment based on the accumulation of correlations from numerous studies using the instrument being evaluated.

Construct validity, according to Obioma & Salau (2007) is "the degree to which a test measures what it claims, or purports, to be measuring." In the classical model of test validity, construct validity is one of three main types of validity evidence, alongside content validity and criterion validity. Modern validity theory defines construct validity as the overarching concern of validity research, subsuming all other types of validity evidence. Construct validity is the appropriateness of inferences made on the basis of observations or measurements (often test scores), specifically whether a test measures the intended construct. Constructs are abstractions that are deliberately created by researchers in order to conceptualize the latent variable, which is correlated with scores on a given measure (although it is not directly observable). Construct validity examines the question: Does the measure behave like the theory says a measure of that construct should behave?

Construct validity is essential to the perceived overall validity of the test. Construct validity is particularly important in the social sciences, psychology, psychometrics and language studies. Psychologists such as Zdzinski & Barnes (2002) have pushed for a unified view of construct validity "...as an integrated evaluative judgment of the degree to which empirical evidence and theoretical rationales support the adequacy and appropriateness of inferences and actions based on test scores..." While Messick's views are popularized in educational measurement and originated in a career around explaining validity in the context of the testing industry, a definition more in line with foundational psychological research, supported by data-driven empirical studies that emphasize statistical and causal reasoning was given by (Borsboom, 2004).

Key to construct validity is the theoretical ideas behind the trait under consideration, i.e. the concepts that organize how aspects of personality, intelligence, etc. are viewed. Researcher belief that, The best construct is the one around which we can build the greatest number of inferences, in the most direct fashion. Scale purification, i.e. the process of eliminating items from multi-item scales (Obioma & Salau 2007) can influence constructs validity. A framework presented highlights that both statistical and judgmental criteria need to be taken under consideration when making scale purification decisions. Another validity measure to be used in this study is concurrent validity is a type of evidence that can be gathered to defend the use of a test for predicting other outcomes. It is a parameter used in sociology, psychology, and other psychometric or behavioural sciences. Concurrent validity is demonstrated when a test correlates well with a measure that has previously been validated. The two measures may be for the same construct, but more often used for different, but presumably related constructs. The two measures in the study are taken at the same time. This is in contrast to predictive validity, where one measure occurs earlier and is meant to predict some later measure. In both cases, the (concurrent) predictive power of the test is analyzed using a simple correlation or linear regression.

Concurrent validity and predictive validity are two types of criterion-related validity. The difference between concurrent validity and predictive validity rests solely on the time at which the two measures are administered. Concurrent validity applies to validation studies in which the two measures are administered at approximately the same time. For example, an employment test may be administered to a group of workers and then the test scores can be correlated with the ratings of the workers' supervisors taken on the same day or in the same week. The resulting correlation would be a concurrent validity coefficient. This type of evidence might be used to support the use of the employment test for future selection of employees.

### Statement of the Problem

The importance of measuring the accuracy and consistency of research instruments (especially the achievement tests and questionnaires) known as validity and reliability, respectively, have been documented in several studies, but their measure is not commonly carried out among educators and social science researchers in developing countries. From the author's personal observation among researchers in developing countries, most students and young researchers are not able to distinguish validity from reliability neither do they know the importance of it. Likewise, they do not have the prerequisite to understand the principles that underline validity and reliability testing of a research measurement tool and achievement tests been conducted by big examining bodies like WAEC, NECO, JAMB, NABTEB and etc. This has been linked to the dearth of knowledge of these tests. This study is meant to determine whether Post-UTME test conducted by University of Ibadan is valid or not.

### Purpose of the Study

The general purpose of this study is to investigate the construct and concurrent validity of Post-Unified Tertiary Matriculation Examinations being conducted by University of Ibadan, Ibadan in order to know whether the instrument is measuring what it is purported to measure or not in Mathematics among the candidates that sat for the test. The specific purposes of the study are to: (i) examine the construct validity of test in Mathematics using the results of the applicants in Unified Tertiary Matriculation Examinations in Mathematics and SSCE results (ii) to determine the concurrent validity of test in Mathematics using the results of the applicants in Unified Tertiary Matriculation Examinations and finally to determine the relationship between SSCE and UTME results.

### Research Questions

In order to address the objectives of this study the following research questions were raised:

- i) What is the construct validity of PUTME of University of Ibadan, Ibadan?
- ii) What is the concurrent validity of PUTME of University of Ibadan, Ibadan?
- iii) What is the relationship between SSCE and UTME results?

### Methodology

This study made use of descriptive research design of ex-post-facto type which does not involve direct control of any variable or any experimental manipulation. The target population for this study consists of all candidates that enrolled for Mathematics in Unified Tertiary Matriculation Examinations and that pick university of Ibadan, as their first choice and that scored above two hundred and participated in post unified tertiary matriculation examinations. The study is restricted to only applicants who sat for Mathematics in UTME and Post-UTM and scored 200 marks and above and that pick university of Ibadan. The candidates must have passed SSCE at least in five subjects including English language and Mathematics at credit level at one sitting or six credits at two sittings and enroll for UTME for 2020/2021 session. The sample for this study was made up of three hundred and fifty-eight participants using simple random sampling procedure. Also simple random sampling was used to select participants that their proposed chosen courses have to do with mathematics. Secondary data were used for the study, they are the grades made in SSCE conducted by either WAEC or NECO, the score obtained in Mathematics by individual candidate in UTME and the score obtained in Mathematics in PUTME conducted by the University of Ibadan. The SSCE results was manipulated by converting A1 = 87.5, B2 = 72, B3 = 67, C4 = 62, C5 = 57, C6 = 52, D7 = 47 and E8 = 42 in percentages to equalize to scores in UTME and PUTME respectively. The data used for this study were retrieved from the records of University of Ibadan admission office. The data was released after a letter of introduction and the purpose that the researcher wants to use the data for was made known to those who are at the helm of affairs of admission at university of Ibadan were contacted. The collected data was analysed using descriptive statistics of mean and standard deviation and Pearson Product Moment Correlation formular to establish the construct and concurrent validity at  $\alpha = 0.05$  level of significance.

### Results

**Research Question 1:** What is the construct validity of PUTME tests constructed by University of Ibadan, Ibadan?

To answer this research question one, the scores obtained in Mathematics in PUTME by the selected candidates in this test must correlates significantly with scores in Mathematics in UTME and the scores obtained in Mathematics in PUTME by the selected candidates in this test must not correlates significantly with scores in Mathematics in SSCE. Because the UTME Mathematics test is meant for selection of competent applicants in to the university likewise the PUTME Mathematics test while SSCE Mathematics test is meant for certification. Therefore, PUTME must converge with UTME and PUTME must diverge with SSCE grade in Mathematics respectively.

**Table1: Descriptive Statistics and Zero Order Correlation among Scores Obtained in Mathematics in SSCE, UTME & PUTME by the Participants**

	Mean	StdDeviation	PUTME	UTME	SSCE
PostUTME Test (PUTME)	58.90	6.371	1.000	.623**	.062
Unified Tertiary Matriculation Exam(UTME)	66.27	6.467	.623**	1.000	.159**
Senior Secondary Certificate Exam(SSCE)	66.31	14.811	.062	.159**	1.000

\*\* . Correlation is significant at the 0.01 level (2-tailed).

The results from Table1 showed that there is positive, strong and significant correlation coefficient between PUTME and UTME,  $r = 0.623$ ,  $p < 0.05$  and there is weak and non significant relationship between PUTME and SSCE,  $r = 0.062$ . Since the results come out this way it indicates that the PUTME has passed the construct validity test and the validity coefficient of it is 0.623.

**Research Question 2:** What is the concurrent validity of PUTME of University of Ibadan, Ibadan?

The results from Table1 showed that there is positive, strong and significant correlation coefficient between PUTME and UTME,  $r = 0.623$ ,  $p < 0.05$  and since  $p < 0.05$  it indicates that the PUTME has passed the concurrent validity test and the concurrent validity coefficient of it is 0.623.

**Research Question 3:** What is the relationship between SSCE and UTME results?

The results from Table1 showed that there is positive, strong and significant correlation coefficient between UTME and SSCE results,  $r = 0.159$ ,  $p < 0.05$  and since  $p < 0.05$  it indicates that the SSCE results has significant relationship with UTME. Therefore, SSCE is a good predictor of UTME score, SSCE results in Mathematics has passed the predictive validity of UTME.

### Discussion

The result of the research question 1 showed that the PUTME Mathematics test correlated significantly with UTME of the University of Ibadan applicants. Some past studies equally established that there was significant correlation between Post-UTME and UTME performance of university Ibadan applicants (Fehintola, 2011). The result of this study also showed that Post-UTME score do not correlated significantly with SSCE performance of University freshmen. This finding is in line with the finding of Obioma and Salau (2007). The results of this study therefore suggest that the PUTME do not converge with SSCE result but is significantly correlated with UTME performances. This findings run contrary to the study that was conducted in UNN in which the SSCE result was a better predictor of the applicants in PUTME performance (Obioma & Salau, 2007). Several factors could be responsible for the difference including organization of the examination and societal morality.

The result shows that, the relative contribution of each of these independent variables on academic performance among the University freshmen in the study, SSCE result appears as the most potent contributor to academic performance among university freshmen. This means that SSCE result of University freshmen is more important than any other factors in predicting their academic performance. Academic self-efficacy, age, UME score and sex in that order follow this.

The SSCE result is a better predictor of UTME. Therefore more attention needs to be given to SSCE examinations as regard teaching of the students while in school, the syllabi, handling of the examination supervision, investigation and marking of the papers. The result of this study also showed that UTME score do correlated significantly with academic performance of University freshmen. This finding is in line with the finding of Obioma and Salau (2007).

### Conclusion

The study was carried out to determine construct and concurrent validity of Post-UTME test of Mathematics constructed and used by university of Ibadan. The test should be used to assess UTME candidates in Mathematics when they have passed the minimum marks in the UTME and processed minimum requirement for admission to the University of Ibadan. Two research questions which centered on validity were drawn to guide the study and it was discovered that the two validity observed were passed by the PUTME test of university of Ibadan.

**Recommendations**

Based on the findings from this study, the following are recommended:

- i) Hence, the constructed PUTME Test has a high validity and reliability. The test can be used by the University of Ibadan and any interested higher institutions in Nigeria to assess students' ability in Mathematics when they want to select applicants for the purpose of admission.
- ii) Since the PUTME Test is highly valid and reliable, it was recommended that it should be used by any institution for admission and other personnel to assess senior secondary three students' achievement.
- iii) The test should be kept in a safe place so that it will remain valid and reliable when used from time to time.
- iv) The test should be used to prepare senior secondary school students for internal and external examinations. The test manual should always be consulted when using the test.

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