

# Predictive validity of screening examination on the overall achievement of science, vocational and technical education students in Nigeria

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**Abstract.** This quantitative study investigated the effects of screening examination in Nigeria to find out if it can be used to predict students overall achievement. The study's objective was determining if there are any significant differences between two groups of candidates admitted with and without the screening examination in science, vocational and technical education programmes. Over 4000 students' results approved in the academic board were used as the source of the data while sample was drawn from candidates with complete results only. An Independent Sample *t*-test was used for data analysis where the cumulative grade point average of groups admitted without screening examination and those admitted with screening examination were compared. The findings indicated that a statistically significant difference exists between the performances of the two groups in Technical Education Programme ( $m = 2.67$ ,  $SD = 0.90$ );  $t(628) = 3.99$ ,  $p = < .00$  (two-tailed). But in Science Education Programme ( $m = 2.71$ ,  $SD = 0.34$ );  $t(178) = 2.14$ ,  $p = > .08$  (two-tailed); Agricultural Science Education Programme ( $m = 2.60$ ,  $SD = 0.79$ );  $t(409) = -0.63$ ,  $p = > .63$  (two-tailed); and Home Economics Education Programme ( $m = 2.75$ ,  $SD = 0.75$ );  $t(148) = 1.14$ ,  $p = > 0.26$  (two-tailed); no statistically significant difference exists between the groups. The paper concluded that according to the findings of this study, the screening examination might not be used to predict the students overall achievement. Some of the limitations of the study as well as recommendations have been highlighted.

**Keywords:** Science education, agricultural science, home economics, technical education, screening examination, college of education, students' achievement.

## INTRODUCTION

Teacher education in Nigeria has received a national attention and was considered one of the avenues of achieving the national objectives as it is clearly contained in the National Policy on Education (NPE, 2004). To actualise this, notable universities in the country established *Advanced Teachers' College*. They creditably carried out the preparation of teachers with a National Certificate in Education – NCE – (NCCE, 2009) alongside *National Technical Teacher Colleges* (NTTC) that eventually metamorphosed to Federal Colleges of Education (Technical). A governing body for such

colleges, national commission for colleges of education (NCCE), was established in 1989 for supervising all the teacher training institutions in the country (NCCE, 2009).

In line with their activities to produce qualitative teachers to Nigerian schools, the colleges have a one year preparatory programme known as *Preliminary NCE* (Pre-NCE for short) to prepare candidates for the normal 3 year NCE programme. Pre-NCE programme in technical colleges in Nigeria was started since their inception in the 1976/77 academic session when they were then NTTC. The programme is to prepare candidates

for the normal NCE programme. Somewhere in the middle, the screening examination into the pre-NCE programme as it was the practice was stopped in the early 1990s in the college studied.

However, from the beginning of the immediate past decade, 2000, it was reintroduced by the new college administration then. This was because the performance of candidates was discouraging as many candidates with good ordinary level results performed below expectation (Yahaya, 2008). In view of this and also to improve the quality of the NCE products, the college deemed it necessary to reintroduce the screening examination. Since then it has been the practice to conduct it and those who are successful can be admitted into the pre-NCE programme.

### **Trends in Nigeria colleges of education and pre-NCE programme**

The establishment of teacher education programme, above the normal Nigerian grades II and III, known as Advanced Teachers' Colleges, for the award of the NCE started in the 1960s. These colleges were later renamed Colleges of Education, COEs, example of which include those of Lagos 1962, Ibadan 1962, Zaria 1962, Kano 1964 and Abraka 1968 (BFFA, 2012; Umar, 2006; Ajibade, 1993; Samuel et al.; Uyanga, 1998). To date, there are well over 100 colleges of education of federal, state and private ownerships. Even at that initial stage, there had been procedures for getting suitably qualified candidates for the programme in each of these colleges at different locations in the country. These procedures are not without some problems which led to the introduction of screening examinations and oral interviews in order to improve on the admission of prospective candidates. The screening examination and interviews help to identify candidates who by some misfortunes of national and international examinations could not get the required grades to qualify them for admission into the programme.

However, the introduction of preliminary programme has attracted criticisms from some quarters across the country. Example, lecturers argued that direct entry admissions especially by individual colleges before the advent of Joint Admission and Matriculation Board – JAMB – were flawed and seemed to be greatly influenced by interior and extraneous variables. Outsiders on the other hand saw an extra one-year preparatory to entering the 3 year NCE programme as a waste of time. This was viewed particularly for candidate who made the requisite minimum entry qualification of three/four credits at the Senior Secondary Certificate Examination (SSCE). Others are West African Examination Certificate (WASC) or the General Certificate of Education (GCE) 'Ordinary' (that is, O) Levels.

Furthermore, there was also the argument in favour of

the one year preliminary course especially in areas that are educationally disadvantaged. A Federal College of Education (Technical) of this study is one of such colleges located in an educationally disadvantaged area. To further complicate issues, it is *Technology* oriented college of education not conventional or liberal one. The college management itself views the training of highly qualified, motivated, conscientious and efficient teachers (NCCE, 2009; NPE, 2004) as paramount, hence the grass root grooming.

The one year programme (one academic session) at the beginning of 1976/77 academic year was only for students of technical education. It was code named 01-year-number. This code 01 was maintained throughout the three year NCE course. There was no pre-examination or test or interview before admission. Candidates who came for direct entry 3 year NCE course had to undergo test/examination and interviews and were given the code 03-year-number while candidates for business education were given the code 02-year-number. No preliminary programme for business education. The codes 04 and 05 were given to technical teacher's certificate (TTC) students of business and technical orientations respectively. By 1989, the school of vocational education with Agricultural Science and Home Economics Education majors was established and given code 06-year-number. There about in 2000/2001, the school of sciences was established, metamorphosing from the departments of mathematics and sciences. With dwindling direct entry admissions from JAMB, the preliminary programme extended to all the schools – science, vocational, business and technical. The need for suitability through quality, test/examination and interviews were vigorously administered for candidates coming through the preliminary programme. The test/examination and interviews were again stopped in 2001/2002 academic session.

### **Rationale for preliminary programme**

The standard of any exercise is a function of the achievement considered in relation to how successful or otherwise based on a laid down set goals. A simple correlations of the exercise's real posture and what is obtainable in reality serves as a yardstick when the outcome runs short of the expectation during the evaluation, hence it is considered deficient. The question is whether there is need to examine or interview a candidate who is going in for preliminary programme for one academic session before embarking on the NCE programme and whether the tests scores and interviews are relevant determinants of his/her suitability for the preliminary programme and subsequently the NCE programme. In the mid-1970s, High School Certificate (HSC) had given way to remedial/preliminary programmes in universities. These preliminary/basic

schools prepare candidates for undergraduate programme in the universities.

However, Dauda and Banu (2001) made an assessment of students with different entry qualification into a university, and came out with the finding that candidates admitted through remedial programmes do not lower standard of the university education. In fact, it suggested that the extra one or two years academic sessions spent preparatory to full admission by remedial students made them more acclimatised to the university systems, hence better performance than direct entry students.

Similarly, lower down from the university level, Musa (2001) compared the performance of junior secondary school 3 (JSS III) students in introductory technology to that of same students in senior secondary school 3 (SSS III) in physics and found out that there is a positive relationship between performance in introductory technology and physics at the JSS and SSS. That means the introductory technology in JSS III can serve as a predictor to performance in SSS III physics. This study is complementing such kind of studies to find out how one exercise or programme serves as a predictor to other performances at higher levels.

Besides, Haruna (2002) when looking into the causes of poor performance of pre-NCE students in chemistry in a college arrived at a finding that poor background in science generally caused the poor performance in chemistry. Consequently, he suggested that remedial programme should continue so as to improve candidates' performance.

All these point to the need for preliminary programme preparatory to beginning the NCE proper. It shows that the programme further grooms the candidates for better performance in their NCE course. Consequently, the need for test or examination and interviews before admission for the course remained the bone of contention while researches on the effects of such test/examination and interviews on the overall achievement of the candidates have been very minimal or remained unknown. This necessitated the need for a study of this kind in all the NCE programmes of the Nigerian colleges of education the finding of which will be significant to decision makers on whether to continue with it or otherwise.

### Statement of the problem

From available reports (Yahaya, 2008; Emma, 2007; Salihi et al., 2007; Hassan, 2001) many students with low entry qualification were found to perform wonderfully well and vice versa. So many factors may be associated to this as Hassan articulates that when norms form the principal basis of determining grades and certification, then certificates does not serve as evidence of capability to perform the expected skills on the part of the students.

That is why most Nigerian higher institutions now conduct screening/selection examinations before admitting candidates into various programmes for further studies. This is purposely for the institutions to check the admission of candidates with unreliable and invalid leaving school certificates.

Moreover, Hassan (2001) also outlined some types of students' performance namely: true performance, adulterated performance and other performances. She did not hesitate to give the relative determinants of such performances which include among others the students, teachers, law enforcement agents, the assessment agents, parents and the society at large. Accusation finger has been pointed to all the above mentioned for contributing in one way or the other to the achievement of adulterated grades in the leaving school examinations. In a similar research carried out by Rowland, David and Brims (2000) results showed that out of 1500 West African students (more than 50% Nigerians) studied to find out correlation between their indigenous entry qualification and their performance at higher institutions of learning, it was discovered that most students performed contrary to expectations. Many performed below expectation and many with a corresponding performance above expectation.

In line with the tradition of the Nigerian tertiary institution, the college studied also conducts the screening examination into its pre-NCE programme with the aim of admitting candidates with valid and reliable entry qualifications. But it was somehow stopped in the beginning of the 1990s and reintroduced again a decade after. However, since the reintroduction of the screening examination, its effects on students' performance have never been studied. Its predictive validity on the overall performance of candidate is at the moment unknown. The thirst for this knowledge justified the need for this study. Consequently, the study's objectives are:

- i) To find out the significant mean difference between students admitted with screening examination and those without it in vocational education (Agricultural Science and Home Economics).
- ii) To find out the significant mean difference between students admitted with screening examination and those without it in science education.
- iii) To find out the significant mean difference between students admitted with screening examination and those without it in technical education.

The following hypotheses have been formulated and tested in the study:

- a) There is no significant mean difference between students admitted with screening examination and those without it in science education. ( $H_{01}: \mu_1 = \mu_2$ )
- b) There is no significant mean difference between students admitted with screening examination and those

without it in vocational education. ( $H_{02}: \mu_3 = \mu_4$ )

c) There is no significant mean difference between students admitted with screening examination and those without it in technical education. ( $H_{03}: \mu_5 = \mu_6$ )

## METHODOLOGY

### Research design, population and sample

The study was a correlational research design where the achievements of two groups of participants have been correlated to find out the significant difference between them. The groups are those candidates admitted through the screening examination and those admitted without the screening examinations. All the students' record in the three NCE programme from 1990/91 to 2008/9 academic session constituted the population of the study. However, a sample is drawn from candidates' records that are traced from screening examination and pre-NCE from well over 4000 candidates. Those admitted without the screening examination formed group 1 of the study participants while those admitted through the screening examination formed group 2 of the study participants. These groups constituted the sample for the study. The number of each group's sample is given in the descriptive statistics table (Table 2).

### Instrument for data collection

The instrument used for data collection was a checklist. It is an instrument used for data collection that consists of prepared list of statement relating to behaviour, traits, performance in some areas or a product of some performance. Each statement in the list is checked in some way to indicate the presence or absence of a particular quality (Awotunde and Ugodulunwa, 2004). Hence, for this research which sought to collect a quantitative data from available students' record, the instrument is suitable as other instruments are unsuitable for this type of research.

### Research participants

The participants of the study were students admitted with or without the screening examination for the pre-NCE programme. They have passed through the pre-NCE and the 3 year NCE programme. Their overall achievement as measured by the cumulative grade point average (CGPA) ranging from 0 to 5 points was used as the gauge of their performance. The study investigated Vocational Education Programme (Agricultural Science and Home economics), Science Education Programme (Biology/Integrated Science) and Technical Education Programme. Any student in the college who was not in one of the programmes mentioned was not involved and was

outside the scope of the study.

## RESULTS

The study used students' record as a source of the data. A prepared checklist was used for recording the students' number and CGPA. The records used were the already prepared results presented and approved in the college's academic board meetings. The statistical tool used for the analysis was the independent sample *t*-test. It is suitable for the analysis of the collected data because it is a type of analysis that is used when mean scores of two groups are compared on some continuous variable (Pallant, 2007; Tabachnick and Fidell 2007; Awotunde and Ugodulunwa, 2004; Gravetter and Wallnau, 2004; Everett, 1996; Stevens, 1996; Cohen, 1988). Here, there were two groups: *admission without the screening examination* group and *admission with screening examination* group. Each group has scores obtained from individual students' overall achievement measured by the CGPA. Therefore, these scores were compared to find out if there was any statistically significant difference between them. The results are hereby presented below.

### Independent sample *t*-test assumptions

#### Level of measurement

For an independent sample *t*-test, data for the analysis should be at the interval level obtained from a continuous variable. This assumption has not been violated for all the three groups studied because the scores obtained are at the interval level using continuous variable not discrete or categorical scores (Pallant, 2007; Tabachnick and Fidell, 2007; Stevens, 1996). The scores on the scale are labelled 0 to 5 where fractions were obtained.

#### Random sampling

Scores were obtained using the random sampling from the population. This was accomplished from the over 4000 students' records used from which the data were captured, while only those with complete results have been considered suitable and formed the sample for the study. That is, not all the participants have complete results traceable from the screening examination to pre-NCE and to the NCE proper programme. Therefore, the captured data used were only those identified from the records. This assures the randomisation of the sample and compliance to the assumption of random sampling.

#### Independence of observation

The scores used are the CGPA of the candidates, not

**Table 1.** Test of normality.

Groups	Kolmogorov-Smirnov		Shapiro - Wilk	
	df	Sig	df	Sig
Science Education <sup>1</sup>	41	.06	41	.00
Science Education <sup>2</sup>	90	.00	90	.01
Agricultural Education <sup>1</sup>	166	.00	166	.00
Agricultural Education <sup>2</sup>	245	.00	245	.00
Home Economics Education <sup>1</sup>	42	.20	42	.90
Home Economics Education <sup>2</sup>	108	.00	108	.00
Technical Education <sup>1</sup>	195	.00	195	.00
Technical Education <sup>2</sup>	435	.00	435	.00

$p > .05$ . <sup>1</sup>Admission without screening exam; <sup>2</sup>Admission with screening exam

**Table 2.** Descriptive statistics of all the groups.

Groups	<i>m</i>	<i>Std/Dev</i>	<i>Std error mean</i>	<i>n</i>
Science Education <sup>1</sup>	2.71	.34	.41	91
Science Education <sup>2</sup>	2.54	.43	.08	43
Agricultural Education <sup>1</sup>	2.37	.90	.06	167
Agricultural Education <sup>2</sup>	2.60	.87	.05	246
Home Economics Education <sup>1</sup>	2.64	.79	.04	43
Home Economics Education <sup>2</sup>	2.47	.68	.08	109
Technical Education <sup>1</sup>	2.67	.43	.06	196
Technical Education <sup>2</sup>	2.37	.75	.04	436

<sup>1</sup>Admission without screening examination; <sup>2</sup>Admission with screening examination.

from the participants' response to any instrument which might be influenced by some other measurement that can lead to the violation of the *assumption of independence* according to Pallant (2007), Stevens, (1996), Gravetter and Wallnau, (2004). They added that such violations occurs if small working group members influences one another or studying a teaching method's impact on behaviour and performance. This gives the quantitative data obtained here a greater degree of independence in compliance with the assumption since only record was used not responses from an instrument.

### **Normal distribution**

The normality test results given in Table 1 showed the Kolmogorov-Smirnov's and Shapiro-Wilk's normality test values for all the groups. The significant values obtained greater than .05 showed that the normality assumption has been met while values less than .05 showed violation. But Tabachnick and Fidell (2007), Pallant (2007) and Cohens (1988) assured that in many researches, scores on the dependent variable are not always normally distributed while most statistical techniques are tolerant in a reasonably strong degree to violation of this assumption. They also pointed out that with large sample size (30+) the violation of this

assumption should not cause any major problem.

Since the sample size used is far more than 30, there is no any problem in violating this assumption, and the violation will not cause any problem to the results obtained.

### **Descriptive statistics**

Table 2 depicts the descriptive information of the data obtained. In the table, the sample size for each group given by '*n*' as well as the mean and standard deviation values are all given.

### **Results presentation**

The actual results of the independent sample *t*-test for all groups are given in Table 3. An SPSS version 20 was used for the analysis of the data obtained. The descriptive statistics of the sample size, means and standard deviation as well as standard error means were given in Table 2.

For the science education groups, an independent sample *t*-test was conducted to compare the achievements of two groups on their CGPA (Table 3). There was no significant mean difference between scores

**Table 3.** An independent sample *t*-test results for all the groups.

Groups	<i>m</i>	<i>SD</i>	<i>t</i>	<i>p</i> < .05	PES*	Decision
Science Education	2.71	.34	(178) = 2.14	.08	.42	Uphold H <sub>0</sub>
Agricultural Science Education	2.60	.79	(409) = -0.63	.63	.60	Uphold H <sub>0</sub>
Home Economics Education	2.75	.75	(148) = 1.14	.26	.32	Uphold H <sub>0</sub>
Technical Education	2.67	.90	(628) = 3.9	.00	.03	Reject H <sub>0</sub>

\*Partial Eta Squared; <sup>1</sup>Admission without Screening Examination; <sup>2</sup>Admission with Screening Examination.

of candidates admitted with screening examination and without screening examination group ( $M = 2.71$ ,  $SD = 0.34$ );  $t(178) = 2.14$ ,  $p = > .08$  (two-tailed). The magnitude of the difference in the means (mean difference = 0.19, 95% CI: = 0.18 to 0.54) was very small (eta squared = 0.42). The results for agricultural science education group showed there was no significant mean difference in the scores of those admitted without screening examination groups and those admitted with screening examination ( $M = 2.60$ ,  $SD = 0.79$ );  $t(409) = -0.63$ ,  $p = > .63$  (two-tailed). The magnitude of the difference in the means (mean difference = -0.03, 95% CI: = -0.20 to 0.10) was very small (eta squared = .00). For science and agricultural education, the null hypothesis that suggests no difference stands upheld. This was justified by the statistical evidence that showed no existence of significant difference.

On the other hand, the independent sample *t*-test was conducted to compare the achievements of home economics education groups. It was found out that there was no significant mean difference between the scores of those admitted without screening examination groups and those admitted with screening examination ( $M = 2.75$ ,  $SD = 0.75$ );  $t(148) = 1.14$ ,  $p = > 0.26$  (two-tailed). The magnitude of the difference in the means (mean difference = 0.15, 95% CI: = -0.11 to 0.42) was very small (partial eta squared = .00). For the technical education groups, results indicated a significant difference between scores of candidates admitted with screening examination and without screening examination group ( $M = 2.67$ ,  $SD = 0.90$ );  $t(628) = 3.99$ ,  $p = < .00$  (two-tailed). The magnitude of the difference in the means (mean difference = 0.30, 95% CI: = 0.15 to 0.45) was very large (eta squared = .025).

## DISCUSSION

Education was for a long time believed to be the means through which a nation can grow. Developed nations have invested so much in their education to the extent that they are counting their progress by the day. In Nigeria, this was discovered that governments at all level are trying much to develop the sector. For instance, establishment of teacher training institution was one giant step for teacher education. It was given attention in the country to the extent that both states and the federal

governments have established teacher training institution solely to cater for the need of the nation's teachers for national development.

From then to date, it has remained the mission and vision of the teacher education the training of well-motivated teachers for the Nigerian schools. Also among the mission and vision is training teachers with high personal and professional discipline, integrity and competence (NCCE, 2009) for primary and secondary schools throughout the nation. This is not forgetting the training teachers on continuous basis to upgrade their quality for effective and efficient sense of social responsibility and commitment to challenging task to bring the desired change in the Nigerian society.

However, the enrolment of candidates into these teacher training institutions remained a cause for alarm. This was because of the fact that there was a screening examination to screen out those who are suspected to have invalid and unreliable entry qualification because the authenticity of the senior secondary examination certificate was questioned. Though the exercise trendily fluctuates, no investigation was ever carried out to find out its effects on the overall academic performance of the candidates. This was the rationale for studies of this kind which will throw light to the general public and decision makers in such institutions.

The results obtained showed that in vocational education (agricultural science, home economics) and science education groups, there was no any significant difference in the overall achievements of those admitted with and without the screening examination. A reverse is the case with technical education where a significant difference exists between such groups. The group admitted without the screening examination unexpectedly posted higher achievement than the group admitted with screening examination. Though other groups have shown no difference in the achievement, this has put a question on the validity and the reliability of the screening examination itself.

It is noteworthy at this juncture that Hassan (2001) discussed some types of students' performance where she categorised it as *true performance*, *adulterated performance* and *other performance*. She further articulates the possible factors that proved to be relative determinants of such performances which include among others the *students*, *teachers*, *law enforcement agents*, *the assessment agents*, *parents* and *the society* at large.

That is to say all these factors contribute in one way or the other to the true or adulterated performance of the candidates. Therefore, it is not surprising if no difference exists between the achievement of candidates admitted with screening examination and those without same. Where difference exists, it was found out that those admitted without the screening examination significantly outperformed the group admitted through the screening test on their overall achievement.

The study compliments that of Yahaya (2008), who studied students' entry qualification and their overall achievement. He found out that on the overall, students performed contrary to expectations. That is their entry qualifications do not truly reflect their performance. This makes it hard to use their entry qualification as a predictor to their true achievement. The screening examination here is one of the candidates' entry requirements because many have been screened out because they failed.

Similarly, Musa (2001) used performance of junior secondary school 3 (JSS III) students in introductory technology as predictor to senior secondary school 3 (SSS III) achievement in physics. Contrary to this study, positive relationship between performance in introductory technology and physics exists. That means the introductory technology in JSS III can serve as a predictor to performance in SSS III physics.

Also complementary to this study was a research carried out by Rowland et al. (2000). In their study involving 1500 West African students (more than 50% Nigerians) to find out correlation between their indigenous entry qualification and their performance in higher institutions of learning, it was discovered that most students performed contrary to expectations. Many performed below expectation and many with a corresponding performance above expectation.

## CONCLUSION

The study was carried out purposely to determine the significant difference between the achievements of candidates admitted into teacher training institution with screening examination and those without it. Four programmes of a college of education were investigated where records of more than four thousand students were used. Those whose records were traced from screening examination to pre-NCE to NCE proper constituted the study sample. From the result obtained for the agricultural science, home economics and science education programmes, their screening examination success might not significantly serve as a predictor to their overall performance. In technical education programme, result indicated a significant difference between the overall performances of the candidates admitted with and without the screening examination. Despite this significant difference, the success in the screening examination could not serve as predictor to

their overall performance simply because those admitted without the screening examination appeared to have outperformed their counterparts. Factors responsible for such difference are not within the scope of this study to investigate. Conclusively, according to the findings of this study, the screening examination has no significant influence in predicting the overall performance of candidates in the teacher training institution studied.

One of the limitations of this study is that it was generally conducted on four programmes of the same college of education without specifying the different combinations found in technical education. Besides, the effects of gender and rural or urban background have not been put into consideration. Similarly, the candidates' entry qualification was ignored despite its possible influence on the overall achievement of candidates.

To this end, it has been recommended that further studies should be carried out to investigate: (i) the effects of the pre-NCE programme on the overall achievement of candidates where gender and educational background should formed the basis of the research questions. (ii) Similar study to be carried out in at least two colleges of education for valid generalisation and (iii) study the predictive validity of entry qualification on different combinations of majors and minors in the Nigerian colleges of education.

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