

## Relationship of Non-Verbal Intelligence Materials as Catalyst for Academic Achievement and Peaceful Co-Existence among Secondary School Students in Nigeria

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### Abstract

This paper examines students' performance in Non-verbal Intelligence tests relative academic achievement of some selected secondary school students. Two hypotheses were formulated with a view to generating data for the ease of analyses. Two non-verbal intelligent tests viz:- Raven's Standard Progressive Matrices (SPM) and AH<sub>4</sub> Part II Non-verbal Reasoning Tests were compared vis-à-vis the academic achievements in order to determine the differences in students' academic achievement. The non-verbal intelligence tests mainly measured the general intelligence as in accuracy of discrimination, establishing logical relations, permutations, visual acuity and perceptual speed among others. The findings revealed that there was no significant relationship in students' performance in Standard Progressive Matrices (SPM) and academic achievements of students; while significant relationship was established between AH<sub>4</sub> Part II Nonverbal Reasoning Test. The findings therefore recommend that non-verbal intelligence test could be utilized to predict achievements especially where language problem seems to be prominent, thus, peaceful co-existence will prevail among student by streamlining their abilities in multi-dimensional approach.

**Keywords:** Non-verbal Intelligence, academic achievement,

### Introduction

It is universally believed that test administration is one of basic techniques of measuring students' performance. However, it is very essential to note that varieties of tests are administered at various stages of learning with a view to serving a particular or specific purpose. Thus, little attention is paid to some aspects of non-verbal abilities of individuals. (Sambo, 2006)

In an ordinary testing situation, it is very difficult to ascertain whether students excel in a particular discipline. Sometimes, a vast number of tests are administered solely without taking into cognizance the level, sex as well as the types of students for which such test are meant for. In spite of merit Binet- Simon scale of intelligence measurement, Child (1977) argued that Binet's test contained many different types of items and they were all assumed to tap general intelligence.

Liu (1922) in Sambo (1996) was of the view despite the revision of Binet- Simon test that their deficiency lies in large proportion test requiring language responses. The criticism of the scale according to him was vigorously presented by Ayres (1982). He further pointed out that the Binet tests predominantly reflect the child's ability of fluency, use of words as they do not reveal his ability to act.

Accordingly, Spearman (1927) cited Mouly (1967) postulated the concept of 'General Intelligence,' is a form of mental energy permeating all mental operations. Furthermore, Mukerjee (2002) supported the notion of general intelligence by asserting that there is a common factor which becomes apparent from the evidence of overlapping effect of different intelligence test scores of individual which Spearman called a "General Intelligence." According to Spearman, general intelligence is what can be called 'g' factor which underlies all mental operations (functions) and is innate in nature. He was however of the view that every individual possess the general ability.

Non-verbal intelligent test could take care of all factors that are liable to constitute or pose problems to individual in the process of testing and this will at least pave the way for feasible prediction of academic success.

### Synopsis on Non- Verbal Intelligence Tests

Psychological tests could be merely divided into two categories viz:- verbal intelligent test and non-verbal intelligence test. Verbal tests require verbal response on the part of the subject or examinee. Non-verbal tests on the other hand do not require verbal response. It is worth to note that non-verbal test could further be sub-divided into performance tests and non-language tests. Performance test is that which requires the subject to do carry out some of the task by means of certain mechanical manipulations; whereas the non-language test is the which require the subject to work with geometric, pattern, designs, figures or pictures.

Spearman (1904) postulated that intelligence is composed of 'General factors' (G factor) which underlies

all mental functions and the multitude of 'Specific factors' (S factor) each specific to a given task. He also accepted the likelihood the 'S' factor dealing with task of the same general nature can be combined into what may be called a 'group factor'. According to Spearman's theory, a child's ability to solve problem in Arithmetic would depend largely on the quality of his 'G' and 'S' factors dealing with a particular problem. General proficiency in arithmetic would imply possession of substantial 'g' factor and of adequate group factors in the function involved in Arithmetic. Thus, individual might differ in the amount of 'g' as well as in the quality of 'S' factors or group factors in a given task.

It is very important to note that general factor 'g' is a form of mental energy permeating all levels of mental operations. It would be most likely for the person who is relatively lacking in general intelligence to be particularly capable in a specific field (Mouly, 1967).

The concept of general intelligence received a wide range of recognition amongst eminent psychologists to the extent that a Non- verbal intelligence test known as Standard Progressive Matrices was developed in Britain by Raven. In the test, questions were designed to measure the postulation of Spearman's 'g' factor requiring chiefly the knowledge of relations among abstract items. This test was regarded by Anastasi (1968), Aiken (1971) and other psychologists as the best measure of 'g' factor and it was described as culture fair test. It consists of 60 matrices or designs from each of which part is removed. The subject picks the missing part from six or eight given answers. The tests require accuracy of discriminations and also involved analogies, permutations, alternation of patterns and other logical relations.

On the other hand, AH<sub>4</sub> (Part II) Non- verbal Reasoning test was developed by Heim (1970). The test consists of five parts: Part I being a test of verbal ability, series completion, comprehension, reasoning, understanding relations, etc. all being presented through the medium of English Language (Mukherjee, 2002). Part II is a similar test but based on non-verbal materials. Like most test of intelligence, this test is speeded and consists of 65 items. The test items gradually increase in item difficulty and item complexity.

Both standard Progressive Matrices and AH<sub>4</sub> (Part II) Non- verbal reasoning tests are used to test the general ability of students. It is therefore pertinent to observe that the use of non- verbal test will take care of language difficulty on the part of students. Thus, a more accurate and valid outcome would be obtained in the course of study.

### **Statement of Problem**

It has been observed that most teachers relied so much on testing students' intelligence their verbal abilities and other aspect that has to do skills etc. It is pertinent at this juncture to note that perceptual ability, visual acuity, accuracy in discrimination and other aspects related to non- verbal abilities of individuals. It is important to note that there were many criticisms leveled against the test of verbal abilities thus, this study is therefore set to give highlight on utilizing non- verbal intelligence as a way of enhancing academic performance among secondary schools students in a bid to poster peaceful co-existence among them.

### **Hypotheses**

Ho 1: There is no significant relationship between scores in Standard Progressive Matrices and Academic Achievements of students

Ho 1: There is no significant relationship between scores in AH<sub>4</sub> (Part II) Non-verbal Reasoning Test and Academic Achievements of students

### **Population and Sampling**

The population for this study comprised of all Senior Secondary School in two Local Government Areas in Kaduna State. The total population was 8,423 students; out of 4,333 students were males and 4,090 were females. The population of SS III in the sampled schools was 717, therefore, samples were randomly selected from both male and female schools and a total of 248 students were randomly selected based on the method of sampling proposed by Krejcie and Morgan (1970)

### **Instrumentation**

The study delved toward identifying the relationship in students' performance in non- verbal intelligence test, therefore the study utilized the test developed by Ravens in 1938 known as Standard Progressive Matrices (SPM) as one of the research instrument. The test was primarily designed to test the Spearman 'g' factor. The test consists of 60 matrices from which each part was removed. The subjects were expected to choose the missing part from six or eight alternatives. The items are grouped into five series, each containing 12 matrices of increasing difficulty but similar in principles. The earlier series require accuracy of discrimination; the later more difficult series involved analogies, permutation, alternation of patterns and other logical relations. The subjects were directed to record their responses by ticking the appropriate letter on the answer sheet.

### Reliability of Standard Progressive Matrices

The retest reliability of Standard Progressive Matrices have been determined by among the group of older children and adults that were moderately homogeneous in age, this varies approximately between .70 and .90. However, correlations with both verbal and performance test of intelligence range between .40 and .75, tending to be higher with performance test than with verbal test. (Burke, 1958)

### AH<sub>4</sub> (Part II) Non- verbal Reasoning Test

AH<sub>4</sub> (Part II) Non- verbal Reasoning test is a test of interdependency developed by Heim (1970). The test will provide the student with some items inform of pictures. The test items would test the students' understanding of some sort of relationships between pictures and diagrams of different complexity. The test consists of 65 items with specific time limit of 10 minutes for each part of this test to be responded to by the subjects. Five alternatives were given and subjects would be required to write the number of correct alternative in the separate sheet provided.

### Test Administration

The tests were administered by the researcher with the assistance of research assistant and classroom teachers under the classroom conditions. The subjects were carefully instructed on how to respond to the tests and the time frame for each test was carefully adhered to.

### Data Matrix

The scores in Standard Progressive Matrices and AH<sub>4</sub> (part II) Non-verbal Reasoning Test of the sample subjects constituted the data matrix of this study as well as the students performance scores in two consecutive terms were obtained for each respondent from the school record.

### Results

The analyses of the results which compared the differences in scores among students were presented in the following tables:

Ho 1: There is no significant relationship between scores in Standard Progressive Matrices and Academic Achievements of students

Table 1: Results of Pearson Product Moment Correlation (Pearson r) analyses on the correlation between Standard Progressive and Academic achievement of students.

Variable	Mean	SD	SE	r	df	P
SPM	16.86	6.83	0.43	0.257	246	0.0001
Academic Achievement	37.45	10.95	0.75			

Table 1 above indicates that there is no significant relationship between standard progressive matrices and academic achievement of students. This is because the calculated correlation index r value is obtained as .257. While the calculated p value of .0001 is less than the 0.05 level of tolerance. This implies that there is close relationship between no-verbal abilities and verbal abilities of students as revealed by the study. Therefore, the null hypothesis is hereby retained.

Ho 2: There is no significant relationship between scores in AH<sub>4</sub> (Part II) Non-verbal Reasoning Test and Academic Achievements of students

Table 2: Results of Pearson Product Moment Correlation (Pearson r) analyses on the correlation between AH<sub>4</sub> (Part II) Non-verbal Reasoning Test and Academic Achievements of students.

Variable	Mean	SD	SE	r	df	P
AH <sub>4</sub>	12.59	6.21	0.39	0.397	246	0.0001
Academic Achievement	37.45	10.95	0.70			

Table 2 above showing 2- tailed test of probability of relationship indicates correlation between AH<sub>4</sub> (Part II) Non-verbal Reasoning Test and academic achievement of students. This is because the calculated correlation index r value is obtained as .257. While the calculated p value of .0001 is less than the 0.05 level of tolerance. This implies that there is close relationship between no-verbal abilities and verbal abilities of students as revealed by the study. Therefore, the null hypothesis is hereby retained.

### Discussion

The result of this study revealed that a significant difference was identified in the performance of male and female students in Non- verbal Reasoning Test. The finding corroborate with the study of Glossop et al (1979) who also discovered significance difference between the achievements of boys and girls in Non-verbal reasoning Test except in mathematics where there is no significance difference in gender performance. Moreover, the study did not identify any gender difference in terms of scores in Standard Progressive Matrices. This therefore suggests that there is an inconsistency between the performance of boys and girls in the two non- verbal tests utilized for the

purpose of this study, hence, contradicting the findings of Glossop et al (1979).

It is worth noting that the generality of students who obtained high scores in non- verbal intelligence test stand better chance to perform well in their academic pursuit as Maqsd (1980) discovered a significant correlation between non- verbal intelligence measures and academic achievements. Accordingly, Cecirelli (1964) also asserted the existence of a significant correlation between Intelligence Quotient measures and academic achievements. This further established that adequate prediction of academic performance presupposes a clear knowledge of the relationship involved. Moreover, Non verbal Intelligence Test could be equated with or similar to performance test in which subjects had to perform or manipulate some concrete materials without much use of language.

In a nutshell, the non-verbal intelligence tests do not only measure the general ability of individuals but also serve as good predictor of academic achievement as Balarabe (1981) and Adeyanju (1985) maintained that the Non- verbal Reasoning Test is one of the best predictors of educational attainment.

It was observed based on the outcome of this study that the generality of students who obtained higher scores in non- verbal intelligence tests stand better chance to perform well in their academic pursuit. Moreover, non- verbal test could be equated to performance test in which subjects would be required to perform or manipulate some concrete materials without much use of language

### Conclusion

It was discovered based on the results of this study that the students' performance correlate significantly with academic achievement, thus, the study suggests that non- verbal intelligence tests do not only measure general ability of individuals, it could as well be used to predict possible academic achievements of students at different levels of learning and with different cultural background. Furthermore, since non- verbal did not require any response, it is therefore important to apply these tests to students who have language or hearing problems so that more avenue would be created for access and qualitative education.

### Recommendations

The following recommendations were made in respect of this study:

1. This study recommends that non-verbal intelligence materials should be incorporated into school curriculum with a view to utilizing them in predicting achievements especially where language problem seems to be prominent.
2. Non- verbal test could also be useful in streaming students into various classes based on their abilities thereby creating harmonious relation among classes of different abilities.

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