## INDISPENSABILITY OF INTELLIGENCE TESTING IN THE REPOSITIONING AND REVITALIZATION OF NIGERIAN EDUCATION

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#### **Abstract**

A complete or at least a satisfactory attainment of educational repositioning and revitalization in Nigeria is predicated on the role intelligence plays. Intelligence is the general mental ability to learn, solve novel problems, educe relationships, quickly process information accurately, think rationally, act purposefully, originate useful ideas, set and achieve goals and effectively adapt to one's environment. Unfortunately, intelligence testing has not been incorporated in Nigerian educational system due to the absence of a test that reliably and validly measures the trait without cultural biases in this country. In this paper, Culture Fair Intelligence Test (CFIT) has been validated and standardized for use in Nigeria to revitalize our educational system. Consequently, the paper absolutely recommends the use of the Culture Fair intelligence Test for ascertaining students' intelligence and the provision of accelerated/enriched school programme for the gifted/talented, timely remedial services for the mentally retarded in addition to the current educational programme for the normal or average students.

#### Introduction

Intelligence, the all-important and most central trait around which all other psychological attributes revolve has neither been duly subjected to empirical investigation by researchers in Nigeria nor has it been accorded its rightful place in our educational system. In attempt at explaining differences in .students<sup>1</sup> academic achievement, our educational researchers have included almost all variables which one could think of in their investigations without consideration of the role intelligence could play.

Each individual has a level of intelligence (acquired both from nature or heredity and nurture, environment or experience), a capacity which underlies his ability to adjust to the new and to most appropriately utilize the old information (Colman, 2003). Intelligence is so fundamental to cognitive development (the process by which a person acquires, stores and utilizes information) that no sound educational programme can be successfully implemented without due attention to the students' intelligence (JPAT, 2002; Mingat, Tan and Sosale, 2003; Ketteridge, Marshall and Fry, 2002; Cryer. 2003; Tracy, 2002; Myers, 2002; Kreitner, Kinicki and Buelens, 2002; Grote, 2002; Feldman, 2000; Santrock, 2001; Herrnsiein and Murray, 1994; Rosenzweig, Breedlove and Leiman, 2002; Berndt, 1997; Silverman and Casazza, 2000 and Elliott KreLochwill, Cook and Travers, 2000). The educational aims of this nation;

- a) inculcation of national consciousness and national unity;
- b) inculcation of the right type of values and attitudes for the survival of the individual and the Nigerian society;
  - c) training of the mind in the understanding of the world around; and
- d) acquisition of appropriate skills, abilities and competences both mental and physical as equipment for the individual to live in and contribute to the development of his society can be actualized maximally only when due attention is given to the learners' intelligence (National Policy on Education, 1998).

This paper therefore aims at laying a solid foundation for investigation and inclusion of intelligence testing in Nigerian educational system by locally validating and standardizing the Culture Fair Intelligence Test published by the Institute for Personality and Ability Testing (1PAT), USA. The test measures individual intelligence in a manner designed to reduce, as much as possible, the influence of verbal fluency, cultural climate and educational level. It uses shapes, patterns, designs and sequences to measure general intellectual skills and potentials of a non-verbal nature. The CFIT has been found to be reliable, valid and bias-free; and is in use in .several foreign countries, in each of which it was first standardized and validated (Sabir, 1988; Berge and Ve; 2000; Grote, 2002; Shaughness, Zechmeister and Zechmeiister, 2000; Mingat, Tan and Sosaie, 2003; Swansoii, 1996; Striker and Rock, 1990: Tirre and Pena, 1993; Gross, 1992; Case, 1987 and Salthouse, 1992). However, its use in Nigeria or any country without first validating and standardizing (i.e. establishing its reliability, validity and norms, using that country's sample), will amount to abuse of the test.

This is because it is psychometrically wrong to use a test standardized on one population for another population (Ratlins. 1990; 1PAT, 1973; 2000; 2002 and Nenty, 1986). This error accounts for disproportionate placement of black children in Educable Mentally Retarded (EMR) classes overseas on the basis of intelligence tests, which were standardized exclusively on white children. The use of a culturally fair intelligence test which has been validated and standardized on blacks (in this case, Nigerians) is the sole psychometric technique for avoiding such errors subsequently.

## Validation of the CFIT for Use in Nigerian Educational System

Validation of the CFIT for use in our educational system demands that its reliability and validity be established, using a Nigerian sample. *Reliability* is a very important quality that scores on a test must possess for the test to be considered good and usable. Reliability is the extent to which a test measures consistently over time (repeated testing), two halves (equivalent forms) and the individual items that constitute the test (internal consistency). Technically, reliability is a coefficient which indicates the proportion of variance in observed scores on a test from the true scores. That is, each score on a test consists of a true component and an error component; and the more reliable a test is, the closer its observed scores are to the true scores. There are four ways of establishing reliability, each of which is a type of reliability viz: test-retest, parallel or equivalent forms, split-half and internal consistency.

In Nigeria, the CFIT has:

- a) test-retest reliability of 0.91;
- b) equivalent forms reliability of 0.91;
- c) split-half reliability of 0.93;
- d) internal consistency reliability of 0.91, using Kuder Richardson<sub>20</sub> and -0.87 with Kuder Richardson<sup>^</sup> (Kpolovie, 1999; and 2001).

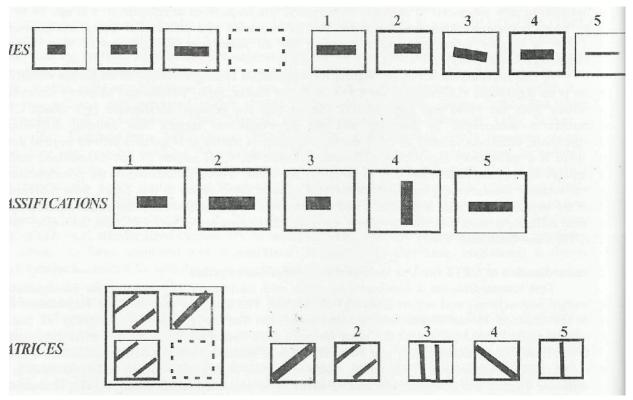
Validity is the most important quality of a test, and it deals with how well the test measures what it purports to measure. There are three main types or ways of establishing validity: content, criterion-related (predictive and "concurrent) and construct validity (via subtest-total correlation, developmental changes evidence and hypothesis-testing evidence). In this country, the CFIT has 0.83 construct validity through sub-total correlation evidence. The test also has a satisfactory construct validity via developmental changes evidence as mean scores of various ages increase systematically significant from age 9 to age 15, after which it flattens out in perfect agreement with Fluid and Crystallized Theory of Intelligence on which the CFIT is based. The theory posits that intelligence which is the basis of all other human characteristics is composed of two general factors: fluid intelligence (gf) and crystallized intelligence (gc). The gf is general to many different fields and is for adaptation to new situation. It depends on heredity, and its peak of development is at age 14 to 15, after which it flattens. Also, that the gf can best be measured with culture fair test of intelligence, a lest that is equally novel or equally common for all examinees, irrespective of their cultural background (Cattel, 1963).

In like manner, the CFIT in Nigeria has hypothesis testing evidence of construct validity as there is no significant difference in the CFIT scores of Hausa, Igbo, Yoruba and Minority students in corollary with the Fluid and Crystallized Theory that the general intelligence (gf) which CFIT measures is determined by heredity and not environmental factors like cultural differences. Furthermore, construct validity of CFIT through hypothesis testing in Nigeria is proved beyond doubt as there is a statistically significant difference between the CFIT scores of institutionalized mental retardates and normal school students in favour of the latter. This is predicated on the principle that if a test actually measures a given construct (fluid general intelligence in this case), then individuals who are objectively ranked high (NSS) and those ranked low (IMR) on that construct automatically behave differently on a test which validly measures that construct (Kpolovie 2003; Ukwujie, 1996; Joe, 1995 and Gronlund, 1985).

## Standardization of CFIT for Use in Nigerian Educational System

Test standardization is concerned basically with uniformity of procedure for administration (standard instructions) and norms (scoring) of the test. The standard and verbatim instructions that must be adhered by all examiners and examinees on the CFIT ensures uniformity of testing conditions; and is analogous with the need for controlled conditions in every scientific experiment. The CFIT has two forms (Form A and Form B), each of which is composed of four subtests (Series, Classifications, Matrices and Conditions). Each of the two Forms has 46 items to be answered in 12 !/2 minutes. That is, the complete test

has 92 items to be answered in 25 minutes. The first subtest (Series) requires the examinee to select from among choices provided, the answer that best continues an incomplete progressive series presented. The second subtest (Classifications) presents the testee with five figures of which he must select the one that is different from the others. The Matrices subtest requires an examinee to correctly complete a design or matrix presented at the left of each row from one\* of the options in the row. The Conditions or Topology subtest requires the testee to select from five options provided, the one which best duplicates conditions contained in



the far left box of each row. Sample items of the Scale are shown below:

Test norms refer to establishment of the average or normal performance on a psychological test; and which serves as a standard against which all scores on that test must be compared and validated for a given population. Norms also indicate the relative frequency of varying degrees of deviation above and below the average; and thus allows for evaluation of different degrees of superiority and inferiority with respect to the trait measured by the test. In fact, psychological tests do not and cannot have any predetermined standards of passing or failing other than the norms derived from standard comparison of scores obtained by al! the examinees from a particular national population.

All the raw scores obtained by the Nigerian standardization sample have been converted to normalized standard score 10 norms with a mean of 100 and a standard of 16 at each of the nine age levels as is universally done.

The formula is 
$$1Q = \frac{X_i - \overline{X}}{Q} \times 16 + 100$$
  
Where:  $X_i = a$  given CFIT raw score at a particular age level.

mean of CFIT raw scores of the age level to which the given raw score falls.

standard deviation of raw scores at the age level in question.

Table 1: Descriptive Statistics of CFIT Raw Scores in Nigeria

Age	X	a	N
9 (8.5-9.4)	46.7182	11.7146	110
10(9.5-10.4)	50.5856 !	11.2310	111
11(10.5-11.4)	55.4727	12.1147	110
12(11.5- 12.4)	57.4455	12.6886	110
13(12.5-13.4)	59.2818	11.4348	110
14(13.5-14.4)	61.1000	11.3202	110
15(14.5-15.4)*	63,7364	9.2535	110
16(15.5-16.4)*	63.1635	11.3840	104
17+(165 & above)*	63.4955	9.0110	1
***!5+(14.5 & above)	63.4708	9.9000	325

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-9.4)	68	69	70	72	73	74	76	77	9 80	81 8	3 84	85	87 88	89	91	92 94	95	96	98	99	100 1	02 103	104	106	107	109		111	113   1	14   115
5-10.4)		62	64	65	66	68	69	71	2 74	75 7	6 78	79	81 82	83	85	86 88	89	91	92	93	95 5	6 98	99		102	103	105	106		111
).5-11.4)			60	61	62	64	65	66 4	8 69	70 7	2 73	74	76 77			81 82	84	85	86	87		0 91	93	94	95	97	98	99		02 103
.5-12.4)				60	62	63	64		7 66	69 7	0 72		74 75			79 81	82	83-	84	86	87 8	8 89	91	92	93	94	96	97	98 9	
2.5-13.4)							58	59 1	60 62	63 6	5 65	67	69 70			74 76	77	79	80	81	83 8	4 86	87	88	90	91	93	94	95 9	
3.5-14.4)	46	48	49	50	52	53	55	55	57 59	60 6			66 67			72 73	74	76	77	79	80 8		84	86	87	89	90	91	93 9	
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.5-	113	11:	5	116	11	8	119	121	122	123	125	126	128	129	131	132	133	13	5	136	138	-								
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0.5-	106	10	7	109	11	0	111	113	114	115	117	118	119	121	122	123	124	12	6	127	128	130	131	132	13	4				
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1.5-	103	10	4	106	10	7	108	110	111	112	113	115	116	117	118	120	121	12	2	123	125	126	127	128	13	0	131	132	133	135
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2.5-	101	10	2	104	10	5	107	108	109	111	112	114	115	116	118	119	121	12	2	123	125	126	128	129	13	0	132	133	135	
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3.5-	98	10	0	101	10	3	104	105	107	108	110	111	113	114	115	117	118	12	0.	121	122	124	125	127	12	28	130	131		
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4.5-	94	96		98	99		101	102	104	106	107	109	111	112	114	115	117	11	9	120	122	123	125	127	12	8	130	132	133	135
-	94	96	T	98	99		101	102	104	106	10.7	109	111	112	114	115	117	11	9	120	122	123	125	127	12	8	130	1	32	32   133

The CFIT IQs in Nigeria have also been converted to Percentile norms, stanine norms and normal curve distribution. Percentile Rank gives the percentage of Nigerian students with intelligence at or below the midpoint of each deviation 1Q.

CFIT IQs of Nigerian students has for the sake of simplicity been converted into Stanine Norms as follows:

Table 3: Stanine of CFIT 1Qs in Nigeria

1Q Range	Percentage	Stanine					
128 and above	4	9					
119-127	7	8					
113-118	12	7					
105-112	17	6					
97-104	20	5					
88-96	17	4					
79-87	12	3					
70-78	7	2					
69 and below	4	1					

While a Stanine of 9 and 8 depict the best 11% of Nigerian students in terms of intelligence, Stanine 6, 5 and 4 fall within one standard deviation above and below mean of a normal curve. CFIT IQs with Stanine 2 and 1 are those whose intelligence fall below -2 standard deviation in a normal curve distribution as illustrated below.

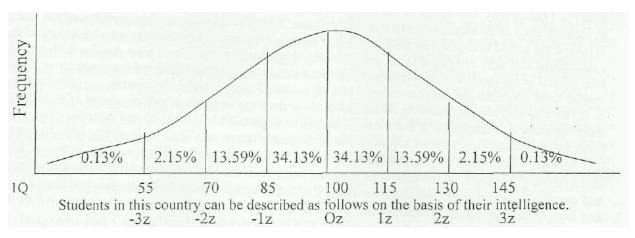


Figure 2: Normal curve distribution of CFIT IQs of Nigerian students

Table 4: Classification of Cl	CFIT 1Qs of Nigerian Students	
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Range of 1Q	Percentage of population	Brief description					
130 and above	2.64	Very superior					
120 - 129	7.40	Superior					
110 – 119	18.66	Above average					
100 - 109	23.43	High average					
90 – 99	25.25	Low average					
80 - 89	11.56	Slow learner					
70 – 79	7.20	Borderline					
69 and below	3.85	Intellectually deficient					

While 2.64% of Nigerian students are classified as *very superior* intelligence wise because their IQs are up to and greater than 130; 7.4% of Nigerian students' IQs range from 120 to 129 and they are termed *superior* intellectually. Students whose IQs fail within HOand 119 form 18.66% and they are described as *above average*. IQs ranging from 100 to 109 and 90 to 99 from 23.43% and 25.25% of the entire population of "Nigerian students and are respectively described as *high average and low average*; and so on.

## Practical Utility of CFIT in Revitalizing Nigerian Education.

Now that the Culture Fair Intelligence Test has been empirically ascertained to have very high reliability coefficients and validity indices in addition to indigenously establishing its norms, intelligence of Nigerians can accurately be measured without cultural basis, using the CFIT.

## 1) Identification, Acceleration and Enrichment of the Gifted/Talented Nigerian Students

Results of this investigation can be employed in the determination of gifted/talented students and for planning of more suitable educational programme to foster, accelerate and enrich the giftedness of such individuals. The greatest resource which nature has endowed every society or country with is the intellectually gifted. All the real great men in the various spheres of lift are the gifted and talented. All extraordinary advancement, scientific and technological breakthroughs, and radical changes for better in any society depend on them (Sternberg, 1988; Sternberg & Wagner, 1985; Myers, 2002; Tracy, 2002; Ketteridge, Marshall & Fry, 2002). Lefrançois (1991, 224) asserts that "our creativity and our intelligence are our only hope for salvation (scientific and technological bliss)". That is why any nation which is genuinely striving at greatness, glory and wealth must seek to identify such individuals at early age and enhance their development and expression of the talents. Who are the gifted and talented students in our country? They are the students who by virtue of their outstanding abilities, are capable of exceptionally high performance; and who require differentiated educational programmes or services beyond those normally provided in regular school so as to fully realize their contributions to the society. The foremost of criteria used for identifying gifted students is 1Q of 130 and above. Students classified or described as "very superior" or whose IQs.lie-at 2 or more standard deviation above the mean as shown in Figure 2 are the gifted and talented ones. They form approximately the best or topmost 3% of Nigerian students. That is, in every 100 students of this Nation, when sampled randomly, three are gifted intellectually. What a great asset we have! Unfortunately however, in the past they have not been identified and accorded the type of accelerated and enriched education they require, for lack of a locally standardized culturally fair intelligence test; and thus, undermining or drastically limiting their contributions to the Nigerian society, Africa and the world at large.

There are two categories or types of gifted children in our country as in the developed nations. These are the (a) generally gifted and (b) prodigious gifted. The first type refers to individuals who are extra-ordinarily intelligent all round, excelling in every task they perform. They score a minimum of 130 in 1Q test. The second category, prodigies, are generally above the average (i.e. 1Q of 115+ or not less than 1 standard deviation-above the mean) and are very talented in one particular domain. It was because of this that Feldman (1988) concluded that the gifted is a composite of both generalists and specialists. On the basis of this, I have broadened the cutoff point for gifted students in this country to start from 1Q of 115 and above as in other countries (Grinder, 1985). It implies that approximately the upper 16% of our students are gifted intellectually. That is, out of every 100 Nigerian students, 16 are gifted and need special accelerated or enriched educational programme. The revelation of this work that there is such high number of giftedness among Nigerian students is of particular importance when compared with what was happening before this research that almost all Nigerian and other Black students were classified to fall below the giftedness category on the basis of classical or traditional intelligence tests (e.g. Stanford-Binet and Wechsier Scales) with exclusively White normative sample; and clumped in Educable Mentally Retarded programmes, overseas. It was on such erroneous ground that Rath-us (1990, 290) wrote that:

Black children tend to attain 1Q scores some 15 to 20 points lower than their Caucasian age mates.

This marked difference made Rath-us to later recommend local validation and standardization of certain existing intelligence tests for use with Blacks. A task which has been meticulously executed by me with Culture Fair Intelligence Test. The advantage is that with the use of our National CFIT norms as provided in this paper, where ever Nigerian students' intelligence is measured with the test, they will compete favourably with their counterparts in other parts of the world; as the appreciable IQ difference due to the effect of exclusively White standardization population has been cancelled out.

# 2) Standardization of CFIT in Nigeria has Practical Utility in the Identification of Mental Retardation Among Our Students and Their Need for Remedial Services

With the validation and standardization of CFIT for use in Nigeria, students who suffer mental retardation can be accurately and easily identified and provided with timely remedial services. On the basis of IQ norms of this investigation, any student with IQ of 70 or less is mentally retarded and this is composed of about 4% of our students. Such IQs fall significantly below average general intelligence of Nigerian students (two standard deviations below the mean as shown in Figure 2). Very close to this category arc the "borderline" menial retardates with IQs between 80 and 70. While the individuals with severe retardation need substantial social services and support throughout their lifetime, those with mild retardation manage to live reasonably independent lives as adults because in spite of their mental disabilities, they are capable of certain remarkable feats. These classifications are in accordance with the American Association on Mental Deficiency (Grossman, 1983). A mentally handicapped who happen to perform a remarkable feat vis-a-vis other mental retardates is termed an idio-savant (Grossman, 1983; Howe, 1989; O'Connor & Hermelin, 1988), Idio-savants are autistic but could do well in a few specific tasks like drawing of natural objects. Such performance does not in any way question their classification on the basis of IO test scores as mental retardates. Knowledge of mentally retarded students gives way for investigating the possible causes and provision of appropriate remedial services like special educational programme for them.

## 3) Diagnosis and Cure of Over-and Under-Achievement

Having got an intelligence test (the CFIT) which is validated and standardized for use in Nigeria, our psychologists and educationists can henceforth research on over-and under-achievement with the aim of enhancing students' academic performance. While over-achievement is when an individual's academic performance becomes significantly higher or better than what is predicted by his general innate mental ability or intelligence; under-achievement refers to a situation in which a student's performance in school or at work is significantly less or lower than what is expected on the basis of his intelligence. The rationale for investigating under-and over-achievement is that with valid and reliable measure of intelligence and educational outcome, it would be possible to identify individuals whose potentially good performance in school is adversely affected by factors other than general mental ability. Once such individuals are identified, the next logical step is determination of the nature of those other factors; and then take the appropriate corrective measures. This type of educational diagnosis and cure can only be done with administration of both test of intelligence and achievement test to students. The discrepancy between a student's scores on the two types of test indicates the extent to which his school achievement falls below or above his intelligence. Such difference is sometimes referred to as Achievement Quotient (AQ). AQ is the ratio of observed educational or academic achievement at a particular age to the expected educational achievement of an individual of that age as predicted by his intelligence.

#### Recommendations

The following recommendations are therefore made for the repositioning and revitalization of Nigerian education with the use of CFIT.

- (i) Whenever and wherever decisions are to be taken on the basis of intelligence of any Nigerian, the Culture Fair Intelligence Test which is the only test of intelligence that has been validated and standardized on Nigerians should be used. This is the most effective way of overcoming problems of undermining or underestimating general mental ability of Nigerians. Selection of Nigerian students for gifted children's programme should be based on the CFIT normative data of this work. In any country overseas where a Nigerian student takes the CFIT, his intelligence should be determined with the normalized standard score [Qs norms for Nigerians as presented in this paper.
- Comprehensive accelerated and highly enriched educational programme should be designed for the gifted (prodigies and generalists) to foster the talents in them. The radical comprehensive accelerated educational programme should aim at moving students rapidly through the conventional curriculum, exposing them fully to the same material which other students pass through. That is, a programme which adequately compresses the ordinary school curriculum so as to enable gifted individuals to master the subjects or courses of studies in just a fraction of the time required ordinarily. Highly enriched educational programme on the other hand involves provision of significantly additional and different school experiences for the gifted in order to deepen and broaden their knowledge and capabilities. This, for instance, requires provision of well equipped resource rooms for execution of various desirable extraordinary projects. These programmes (accelerated and enriched) should be at all the three educational levels (primary, secondary and tertiary). The cost of running them should be borne fully by the government and multinational corporations so that even gifted children from very poor economic background will be able to continue without financial hindrance. Far from being Utopian, this recommendation is very practicable and it is what has being in use in the United States since 1972 in accordance with U.S. Public Law 91-230 and is still adopted and advocated in the recent educational reform by the U.S. Department of Education, National Commission on Excellence in Education (1983).
- (iii) In-service training for teachers on and inclusion of a course on fostering of intelligence among mentally retarded, average and gifted students as a core educational course in universities and colleges-of education. Every teacher must be made skillful in the art of fostering intelligence in the retardates, average and gifted students. Through appropriate in-service training or seminars/workshops, already existing teachers can acquire the requisite skills. By including an educational core course in all institutions where teachers are educated, subsequent teachers will be prepared adequately to most effectively teach the various types of students (intelligence wise). Such workshop or course should explicitly cover the information processing patterns of gifted, average and retarded students and the best types of instructional/environmental intervention for each category that could enable them manifest their very best. With the findings of this work that has made bare the high percentage of exceptional students among average ones in our classrooms, it has become very necessary for teachers to learn more and more about exceptionality and what can be done to optimally help such students in order to realize the noble goals of our beloved nation. Even when the students are eventually separated into their various groups (gifted; average and retarded) teachers must learn from the workshops and the newly proposed educational core course on how to be of greatest importance or assistance to each group.
- (iv) Mental retardates identified with the CFIT among our students should be provided with remedial educational programme. Approximately 16% of students in this country (IQs ranging from 85 and below) greatly require special remedial educational programme and high-quality environment in order to appreciably remedy their handicaps so as not to become complete liability to our society. To ensure the desired environment at home, mass enlightenment campaign on the type of parent-child and sibling relationship that fosters intellectual development should be embarked on. Provision of high-quality home and school environments for remediation of mental retardates is in accordance with the rubber-band hypothesis, which compares innate potential for intellectual development with a rubber band. At any time, intelligence is reflected by the length of the band. Certainly, a short piece of the band (poorer genetic background or fluid intelligence) can be stretched; but it requires a great deal of effort to stretch it a long way vis-a-vis a long piece of rubber band (greater gf). The family and school's primary function is to stretch the rubber band at early age of the child.
- (v) It must also be recommended or cautioned in unmistakable terms and sternly that whenever and wherever the CF1T is to be used for Nigerian students with the norms of this investigation that:
- a. CF1T data should never be used to undermine, discredit or derogate any student; but to direct action towards more desirable outcomes about the student. That is, the CFIT IQs should be used purely for provision of adaptive strategies that will result in the betterment of the examinees; such as identification of students who require special attention and actually according them such services which can improve their

contributions to societal advancement or development.

b. For research purposes, the raw scores be first converted to deviation IQs or normalized standard score IQs, using the norms Table of this investigation before other comparisons. That is, the raw scores which are still affected by differences in age should not be used as the subjects in the research might not be matched age wise. For instance, when correlating intelligence with academic achievement, it must be the CFIT IQs that should be used and certainly not the raw scores.

#### Conclusion

The greatest resource that nature has endowed every nation with, is the intellectually gifted. All the real great men in the various spheres of life world-over are the gifted and talented. All extraordinary advancement, scientific and technological breakthroughs and radical changes for better in any society depend on them. Indeed, any nation which is genuinely striving at greatness, glory and wealth, must seek to identify such individuals at early age and enhance their development and expression of the talents. Nigeria cannot afford to continue to be left out in this direction. Nigeria must henceforth incorporate intelligence testing in her educational system for the identification of the gifted and the maximization of their contributions to national development. The use of the Culture Fair Intelligence Test (CF1T), which has unquestionable reliability and impeccable validity in measuring intelligence in this Country, is the surest answer to the repositioning and revitalization of the Nation's educational system.

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