UNIJERPS
Unizik Journal of Educational Research and Policy Studies VOL.19 (2);
January-June, 2025 https://unijerps.org
2023 Impact Factor: **6.834;** 2022 ***Impact Factor***: 5.156; ***2021 Impact Factor: 5.641;***
2020 Impact Factor: 5.355. *Indexing and Impact Factor URL: http://sjifactor.com/passport.php?id=21363*

DEVELOPMENT AND VALIDATION OF AN INSTRUMENT FOR IDENTIFICATION OF GIFTEDNESS IN PRIMARY SCHOOL PUPILS IN IMO STATE, NIGERIA

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ABSTRACT

The purpose of the study was to develop and validate an instrument for the identification of giftedness in primary schools in Imo State. The sample size of this study comprised 1000 pupils that were used for factor analysis and norming which was obtained through multi-stage sampling procedure. 80 items were generated as initial draft of the instrument which was subjected to preliminary validation to obtain 70 items. The 70 items which constituted the second draft of the instrument were trial-tested to obtain 42 items. The 42 items that constituted the third draft were subjected to factor analysis to obtain 24 items that composed the final draft of the Primary School Giftedness Identification Test (PSGIT). Data collected were analyzed using principal factor analysis, varimax rotation, Cronbach alpha, mean, standard deviation and paired t-test. The findings of the study revealed that PSGIT is a valid and reliable instrument for the identification of giftedness in primary schools. It was recommended among others that school administrators should organize seminars and workshops for their teachers on the need to identify giftedness among primary school pupils with use of a valid and reliable instrument.

Keywords: Development and Validation; Instrument; Identification; Giftedness; Primary Schools.

Introduction

The essence of identification of giftedness is to make structural and instructional provisions for such children to learn at their own pace. Thus, if giftedness is not identified, the tendency is that the non-gifted and gifted will be mainstreamed which will make learning experiences unchallenging to the gifted child. Identifying giftedness could be a challenging exercise. Early identification is the first and important step towards the improvement of the educational, social and emotional development of gifted children which is capable of maximizing their contribution to society (Silverman, 2013).

It must be noted that selecting instruments for the identification of giftedness appears problematic. Similarly, Siegle and McCoach (2018) asserted that proper identification of giftedness can be difficult, since the potential of gifted pupils is not always reflected in academic achievement. This is not unconnected to the misconception that giftedness is an exclusive synonym of high intelligence (Tan, Youth, Desmet and Pereira, 2019). Thus, it has been identified through tests that estimated the intelligence quotient (Sternberg and Kaufman, 2018) which culminated in the exclusion of many potentials that are not adequately evaluated by this type of instrument, or even by the limitations of the areas in which they evaluate. Going further, the high time and cost required to complete the process of identification (Nakano, 2021) reduces the number of identifications that are done,

leading to the underreporting of cases. Thus, it is expected that the use of classroom teachers for the identification of giftedness may be a possible solution since it has the advantage of reduced cost and shortening the screening time.

Considerably, comprehensive nature of the identification approaches ensures that classroom teachers and teachers of the gifted would not challenge the validity of identification procedures for lack of objectivity, investigative depth and for procedural inadequacies. Classroom teachers can identify behaviours that are 'typically' presented by gifted pupils (Hertzog, Mun, Duruz and Holliday, 2018), to be consulted within a process of systematic observation of pupils (Cleveland, 2017). The teacher evaluation scales have thus been used as a first filter for students with a view to offering them a comprehensive evaluation (Nakano, Campos and Santos, 2016). Nevertheless, some primary school teachers fail to identify gifted children with utmost precision. The Federal Government of Nigeria (FRN, 2013) attempted to mitigate this problem when it stated that in addition to other objectives of special education, is the provision of opportunities for the exceptionally gifted to develop their traits, talents and natural endowments at their own pace in the interest of the nation. The implementation of this policy by the classroom teachers has been carried out with the use of ability tests to identify giftedness through exceptional test performance. This, however, has proven defective given that giftedness entails more than exceptional performance in ability test but an outstanding performance in test of general intellectual ability as well as cognitive ability (Ogugua and Okwa, 2018).

In Imo State, aside from academic report records, based on the researcher's observation form literature, it is rather worrisome that instrument used for the identification of giftedness by primary school teachers did not cover verbal reasoning, abstract reasoning and numerical reasoning ability nor was it normed to obtain a standard for interpretation. Hence, there is need for appropriate instrument for the identification of giftedness in primary school pupils in Imo State. Thus, the following research questions were raised:

1. How valid (construct validity) are the items in the Primary Schools' Giftedness Identification Test?
2. What is the internal consistency reliability of the Primary Schools' Giftedness Identification Test?

Guidelines on the use of Instruments in the Identification of Gifted Children

Adams, Callahan, Bland and Hunsaker (2021) stipulated the following guidelines for the identification of gifted and talented children:

1. Clearly define broadened conception of giftedness. Standardized instrument, process and performance indicators and multiple scores of data (such as- pupils, teachers, parents and peers) should be used to get complete picture of the pupils being identified.
2. Apply separate and unique instructions for different areas of gifted.
3. Instruments under construction should be assessed by using instruments that is reliable and valid.
4. Identify or screen pupils without using single cut-off score or summed matrix scores. However, the use of non-traditional methods

for effective identification of underserved population that may manifest giftedness in different ways.

5. Identify pupils based on their needs.

Instruments on Identification of Giftedness

Instruments on identification of giftedness have been developed by several researchers. These include: Screening of Giftedness Indicators, Teacher Version (Nakano, 2021); The Precocity Identification Scale and Talent/Giftedness Indicators (Martins, 2020); Giftedness and Talent Identification Scale (Freitas, Schelini and Pérez, 2017); Guide for Direct Observation in the Classroom (Guenther, 2014). Additionally, an international instrument on giftedness has been adapted viz: the Hope Scale (Rondini, Pedro and Nakano, 2022). A cursory look at the afore-mentioned instruments revealed that much as they made allusions to behaviours related to intellectual giftedness in general, none gave prominence to specific cognitive skills (Farias, Nakano and Wechsler, 2023). More so, the validity and reliability of the afore-mentioned instruments are suspect given that none of the instruments, to the researcher's knowledge, has been validated in the current area of study with a view to suiting its structural and instructional peculiarities. Thus, there is need to develop a valid and reliable instrument for identification of giftedness among school pupils in the study area.

Method

Research Design: This study employed instrumentation design. An instrumentation design is concerned with the scientific calibration and standardization of instrument (Esomonu, 2021). In this study, the researcher developed and validated an instrument for identification of pupils who are gifted in the primary schools.

Population and Sample Size for the Study: The population of the study was made up of 88, 147 (41, 333 males and 46, 814 females) primary six pupils between the ages of 10 and 12 years in the 1289 public primary schools in Imo State (Research and Statistics Unit, Imo State Universal Basic Education Board (IMSUBEB), Owerri, 2024). The sample size of this study comprised 1000 pupils that were used for factor analysis. Purposive, simple random and proportionate stratified sampling techniques were utilized to constitute the sample size at each stage. First, purposive sampling technique was used to obtain one zone (Orlu) from all the education zones in Imo State. The sampled zone has the highest number of primary schools and local government areas (12 LGAs) in the state. Second, simple random sampling technique (balloting without replacement) was used to obtain six local government areas out of the 12 local government areas in the zone that constituted the sample for the study. This was done in such a manner that every of the 12 local government areas had an equal chance of being obtained. Third, proportionate stratified sampling technique was used to obtain 50% of the schools in the six LGAs sampled for the study. Last, all the pupils in the 28 schools in the local government areas were used to compose the sample size for the study.

Procedure: The following steps were taken in the development and validation of PGSIT:

1. Determine the purpose of the test.
2. Outline topics/content to be covered.
3. Outline the instructional objectives.
4. Develop a table of specification.

5. Select an appropriate item format
6. Generate items**:** Here, items were developed from literature in line with sub-scales of giftedness. 80 items were generated. This formed the first draft of the PSGIT.
7. Preliminary validation of instrument: The validation of the draft of PSGIT was done by three experts; one in the Department of Educational Foundations, the other one in the Department of Guidance and Counselling, Nnamdi Azikiwe University, Awka while the third expert is in the Department of Fine and Applied Arts, Imo state University, Owerri. They were asked to look at the PSGIT with a view to ascertaining the extent to which the items are connected to the research questions and purpose of the study. In addition to face validity, content validity was done. The inputs of the experts on the purpose of the study, research questions and hypotheses led to various modifications such as deletion and addition of some items in the PSGIT.
8. Instrument modification**:** In line with the experts' inputs, certain modifications such as the removal of unwanted items and the re-wording of some items in the PSGIT to suit the purpose of the study. The items that survived were assembled to make up the second draft of the PSGIT.
9. Trial testing: At the expiration of the face and content validation, the 60 items that survived were produced. Thereafter, the 60 items that survived were administered on 300 primary six pupils in Imo State.
10. Item analysis: Item-total correlation was utilized for item analysis with a view to ascertaining the items that composed the third draft of the instrument. The use of item-total correlation was justified by the fact that it sought to ascertain if any of the test items did not have responses that vary in line with those for other tests across the population. The psychometric properties of the test to be determined include reliability and validity. Thus, it determined whether or not responses to a given test should be included in the set being averaged. An item was accepted if its correlation value fell between 0.3 and 0.7.
11. Production of the third draft of the instrument: In view of the result of the item analysis, 30 items that survived were used to compose the third draft.
12. Factor analysis: Items in the third draft of the instrument were subjected to confirmatory factor analysis which was carried out by administering items of PSGIT to 600 primary school pupils with the exclusion of those used for trial testing. The outcome of the factor analysis showed if the PSGIT was uni-dimensional or not. The criteria for accepting items for the final draft was based on the fact that the factor had at least three items each with a factor loading of 0.30 as stipulated by Costello and Osborne (2005).
13. Final draft of the instrument: The outcome of the factor analysis led to the final draft of the PSGIT.
14. Establishment of reliability of the instrument: At the expiration of factor analysis, PSGIT was

administered to 1000 primary school pupils from the area of study. Cronbach alpha method was employed to establish the reliability.

Data Analysis: Principal factor analysis and varimax rotation were used for analysis of data to answer Research Question 1. The justification for the use of principal factor analysis was to obtain the minimum number of factors required to represent the available data set while the varimax rotation was to minimize the number of variables that have high loadings on each factor. Varimax tends to focus on maximizing the differences between the squared pattern structure coefficients on a factor (i.e., focuses on a column perspective). The range of acceptance is 0.50 and above. Data for Research Question 2 were analysed using Cronbach alpha. Cronbach alpha was used as the items of the instrument are internally consistent. The range of acceptance is 0.80 and above.

Results

Table 1 KMO and Bartlett's Tests

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.624
Bartlett's Test of Sphericity	Approx. Chi-Square	2893.108
	Df	586
	p-value.	.000

Table 1 shows the KMO and Bartlett's tests for determining the adequacy of sample size for factor analysis. The test value of .624 indicates that the sample is in support of the use of factor analysis. This is so given that the value is within the 0.50 adequacy criterion indicated by Field (2018). Besides, the Bartlett's tests of sphericity is significant at p<0.001 which indicates that the correlation matrix has significant correlations among at least some of the variables.

Table 2: Total Variance Explained by the three Factors Extracted

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.313	24.250	24.250	4.313	24.250	24.250
2	2.479	18.917	43.167	2.479	18.917	43.167
3	1.249	12.797	55.964	1.249	12.797	55.964
4	.908	9.831	65.795	.908	9.831	65.795
5	.895	5.579	71.374	.895	5.579	71.374
6	.874	4.246	75.620	.874	4.246	75.620
7	.865	1.932	77.552	.865	1.932	77.552
8	.850	1.839	79.391	.850	1.839	79.391
9	.839	1.365	80.756	.839	1.365	80.756

10	.835	1.298	82.054	.835	1.298	82.054
11	.822	1.172	83.846	.822	1.172	83.846
12	.776	1.125	84.351	.776	1.125	84.351
13	.717	1.057	85.408	.717	1.057	85.408
14	.682	1.002	86.410	.682	1.002	86.410
15	.539	0.948	87.358	.539	0.948	87.358
16	.516	0.947	88.305	.516	0.947	88.305
17	.443	0.944	89.249	.443	0.944	89.249
18	.392	0.930	90.179	.392	0.930	90.179
19	.374	0.901	91.080	.374	0.901	91.080
20	.339	0.890	91.970	.339	0.890	91.970
21	.297	0.872	92.442	.297	0.872	92.442
22	.239	0.867	93.709	.239	0.867	93.709
23.	.216	0.847	94.556	.216	0.847	94.556
24.	.203	0.844	95.400	.203	0.844	95.400
25.	.192	0.830	96.230	.192	0.830	96.230
26.	.174	0.801	97.031	.174	0.801	97.031
27.	.169	0.790	97.821	.169	0.790	97.821
28.	.157	0.772	98.593	.157	0.772	98.593
29.	.149	0.767	99.360	.149	0.767	99.360
30.	.142	0.640	100.000	.142	0.640	100.000

Extraction Method: Principal Component Analysis.

Principal Component method was used for the extraction of the factors from the 30-item PSGIT. From the number, a total of three factors were extracted. These three factors explained 55.964% of the variance in the whole data. This suggests that greater proportion of the variance in the data was explained by the factors extracted.

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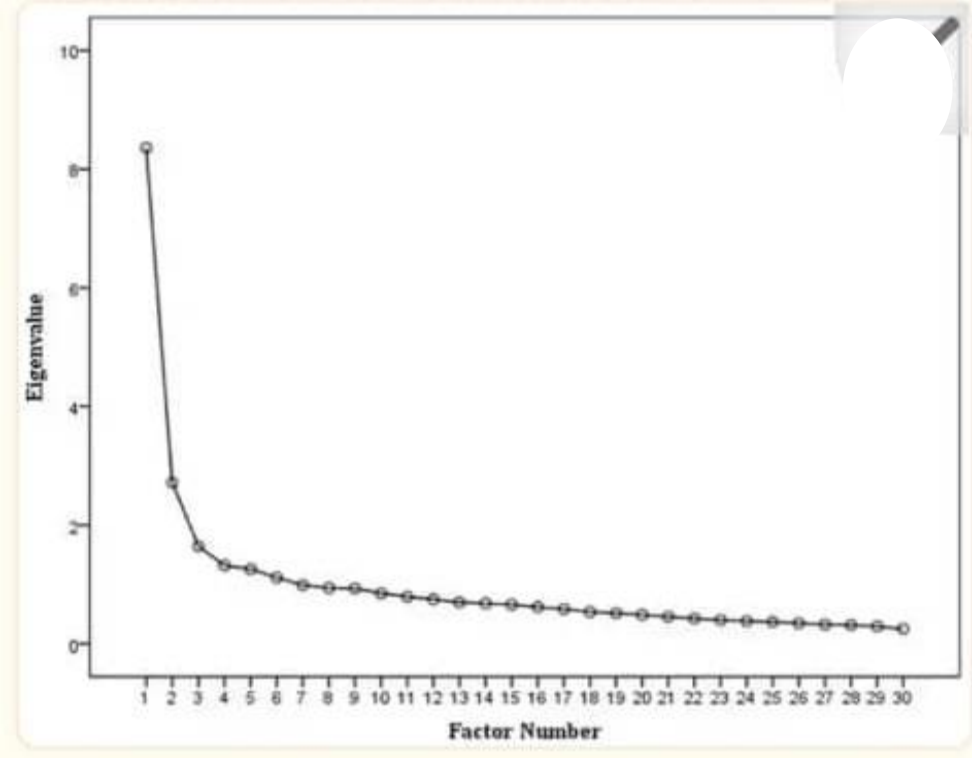


Figure 2: Scree plot

The scree plot presented in Figure 2 shows that only three meaningful factors can be extracted. Initial retention of the three factors is supported by the total variance of 55.964% accounted by the three factors. Equally, retention of the three factors meets Kaiser's (1960) criteria for retaining factors with eigen values greater than 1.

Research Question 1: How valid is the PSGIT?
This question is answered, using factor analysis. The result is presented in Tables 1, 2 and 3.

Naming of the Factors

	Factor 1 –Verbal Reasoning	**Loading**
1.	Recreation was ensured to be observed in the schools by _____	
A.	schools	
B.	teachers	.802
C.	government	
D.	pupils	
2.	Some _____ pupils avoid recreation.	
A.	brilliant	
B.	weak	
C.	lazy	.462
D.	sharp	

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Choose from the options lettered A-D the one that is nearest in meaning to the expression in italics (Nos. 4 and 5)

4.The boy's expression '*baffled*' me completely

A. impressed
B. tempted
C. confused .712
D. motivated

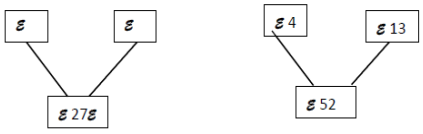
5.The defeated team felt '*humiliated*'

A. cheated
B. unhappy
C. indifferent .463
D. disgrace

	Factor 2 – Numerical Reasoning	**Loading**
6.	If 3:2 is expressed in the form of P:4, find the value of P	.504
A.	3	
B.	6	
C.	1	
D.	4	
7.	If X – 31 = 52. What is X	.390
A.	83	
B.	53	
C.	54	
D.	67	
9.	What is the average of 15, 18, and 24?	.343
A.	19 B. 17 C. 22. D. 37	

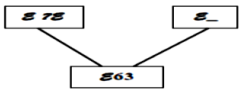
Below are series of problems that are based on quantitative reasoning. Before answering the questions, study the sample that precedes each set and use it to tackle the problems in the set.

SAMPLE A



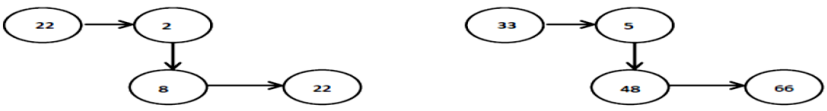
Use the above example to answer Question 12

.351



A. 8
B. 10
C. 441
D. 9.

SAMPLE C



Use the above sample to answer question 18

18.

.325

A. 5
B. 2
C. 4
D. 7



Factor 3 – Abstract Reasoning	**Loading**

Each of the following items consists of four words lettered **A – D**. Three of them have at least something in common while one is odd. Pick out the one that does **NOT** belong to the group.

An example is given below:

A. Fork
B. Spoon
C. Pen
D. Knife

The word that does not belong to the group is "pen" which is lettered 'C'. We would therefore shade answer space 'C' on the answer sheet. Use the above example to answer Question 22.

22.

A. Hospital

A. Clinic
B. Dispensary
C. Church.

.721

In each of the following question, two incomplete words are given. Choose from the options lettered A to D the one that will correctly complete the word and begin the second.

An example is given below

( ) OOM
O
N
E

A. C
B. R
C. Z
D. T

The only letter that best completes the first word and begins the second is 'Z' which is lettered 'C'. We would therefore shade the answer space 'C' on the answer sheet. Use the above example to answer Questions 23 and 24.

23.

Di ( )

o
a
t .706

A. c
B. d
C. g
D. s

24. W ( ) ip

o
u
s
e

A. g
B. h
C. s
D. f

.491

The words below are written in certain codes. Study the examples given in each question and use its code to answer the question.

An example is given below.

SPIT is coded as **5432**, how would **TIPS** be code?

A. 3254
B. 4523
C. 2345
D. 3452.

The correct code is **2345** which is lettered **'C'**. We will therefore shade answer space **'C'** on the answer sheet. Now Use the above example to answer Questions 26.

26. Law is to Client as Architect is to _____

A. Judge
B. Teacher
C. Building
D. Doctor

.552

27. Doctor is to Patient as Teacher is to _____ .324

A. Prisoner
B. Buyer
C. Nurse
D. Pupils

28. As proud as _____
.310
A. peacock
B. lion
C. rabbit
D. goat

The Table above shows the naming of the factors based on the items that loaded in them. The 0.3 criterion was used to determine a vital factor loading. Factors with less than three items each were not included as recommended by Costello and Osborne (2005). Consequently, were not be part of the final draft of the PSGIT. Overall, the results indicated that factor analysis has not only identified irrelevant items but has made provision for the extraction of valid factors from the data set of PSGIT.

Research Question 2: What is the reliability coefficient of PSGIT?

This question is answered using Cronbach alpha. The result is presented in Table 4.

Table 4

Reliability of PSGIT and its Sub-Scale based on Cronbach Alpha

Scale Dimension	No of items	Items	Cronbach Alpha
Verbal Reasoning	4	1, 2, 4, 5	.75
Numerical Reasoning	5	6, 7, 9, 12, 18	.73
Abstract Reasoning	6	22, 23, 24, 26, 27, 28	.78
Entire Scale	15		.75

Table 4 shows that the reliability coefficient of the sub-scales of verbal reasoning, numerical reasoning and abstract reasoning are .75, .73, and .75 respectively. The overall reliability of PSGIT is .75 which is above 0.70 as recommended by Shrestha (2021). This indicates that PSGIT is reliable. Details in Appendix M, Page 140.

Discussion

Construct validity of the items in the Primary Schools' Giftedness Identification Test

The findings of the study revealed that is a valid instrument. Apparently, the PSGIT measured what it intended to measure. The finding of the study is corroborated by those of El-Hajjar (2018) that construct validity of a measurement is the amount to which it really measures what it claims to measure. In other words, there has to be a consonance between what one intends to measure and what one eventually

measures. The finding of the current study is further corroborated by the position of Okoye (2015) pointed that trait measures are constructs in the sense that they are things that scientists literally put together to account for phenomenon in the world. Furthermore, the finding of the current study is consistent with that of Oguguo and Okwa (2018) who developed and preliminarily validated test instrument (called Giftedness Identification Instrument) and found that the instrument had high concurrent validity index.

Internal consistency reliability of the Primary Schools' Giftedness Identification Test

The findings of the study revealed that PSGIT is a reliable instrument. This is in line with the recommendation of Nworgu (2015) that the adequate threshold value for Cronbach alpha should be greater than or equal to 0.80. Put differently, the variables within the factors are considered to be internally consistent. The finding of the current study aligns with that of Oguguo and Okwa (2018) who developed and preliminarily validated test instrument (called Giftedness Identification Instrument) and found that the instrument had high reliability index. Apparently, the place of a reliable instrument in measuring giftedness cannot be over-stressed.

Conclusion

In view of the findings of the study, the conclusion was that PSGIT is a valid and reliable instrument for identifying giftedness in primary school pupils.

Recommendations

In line with the findings, the following recommendations were made:

1. Research supervisors should devise supervisory strategies that will improve postgraduate students' attitude towards thesis writing.
2. College of postgraduate studies should consistently conduct seminars and workshops for postgraduate students on the need to improve their attitude towards thesis writing.
3. Doctoral students should take the art of thesis writing seriously in order to bridge the attitude gap between and their masters' counterparts.

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