
Creativity Scores and Performance in Mathematics: Towards Vision 20:2020

By

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Abstract

Education has over the years been the driving force behind all developmental changes. The current developmental plan termed the vision 20:2020 will be an illusion if the education section is not tailored towards its achievement. A reform in the area of assessment of learning outcome is deemed to be appropriate. While this paper is proposing the introduction of test of creativity in school, it does not lose sight of the fact that it should be presented as a proven instrument for educational assessment. Hence this study was undertaken to ascertain the workability prior to introduction. A sample of 240 students were randomly drawn from two junior secondary schools in Owerri Municipal Council and were made to write integrated science test of creativity and mathematics achievement test. Their scores in the two tests were correlated to obtain an index 0.37. Further treatment indicated that the index was significantly different from zero. It was recommended that since the students were able to write the test creativity and their performance has positive relationship with achievement test, tests of creativity is a reliable instrument for estimating abilities of students in school.

In the previous research works carried out by this writer in the area of creativity, the need to introduce test of creativity in school were highlighted (Offor 2007, 2010 and Ogomaka and Offor 2008). This paper was necessitated by an issue raised by other proponents of test of creativity which appeared to cast aspersions on the workability of test of creativity as an instrument of educational measurement. It looked as if creativity is a mystical phenomenon that cannot easily be taught and

The Intuition assessed in school. Perhaps this idea resulted in the differing opinions about the anticipated relationship that should exist between achievement test currently in use in school and the test of creativity being proposed. The argument was that if test of creativity was to be of proven value as a predictor of achievement, its validity has to be ascertained. Some felt that such creative measure should have no relationship with achievement test scores but should correlate perfectly with independent measures of creativity in real life settings. Yet research results that confirmed a low positive relationship between test of creativity and achievement test scores abound (Thorndike and Hagen 1971, Feldman, Papalia and Olds 2001).

This present a scenario that the functionality of test of creativity in relation to the existing achievement test is still a matter of debate waiting to be proven through empirical data. This writer was intrigued by not only to contribute to the advancement of knowledge in this regard but also to ascertain what the situation is in our local setting since the works already done were carried out in foreign lands. In addition to this, it is important that all doubts about tests of creativity be cleared to ensure its use in school. This is because introducing test of creativity in school will enable the highly creative students (who are the hope in technological advancement) to be identified and harnessed. Evidence has shown that the faith in the use of achievement test alone in evaluation of learning outcome has not helped much in improving students' skills because achievement test is prone to cheating. The vision 20:2020 project which is aimed at "fashioning out a new path that will see the nation becoming one of the 20 best productions, parents and teacher nominations and students interviews were meant to cover all aspects of human intelligence.

The continuo assessment which is in vogue in Nigerian school system makes predominant use of achievement tests which are prone to cheating. The worry is whether such assessment that makes use of only one type of test can ever appraise the varying skills of the students. As awareness for tests of creativity continues to increase, scholars had come up with proposals for their introduction in the school system (Offor 2007, Onu 2008 and Ogomaka and Offor 2008). Orluwene and Essien (2009) showed in their research work that students taught with divergent questioning had better creative performance in chemistry than those taught using convergent questioning. This was so because divergent thinking and originality are hallmarks of creativity (Feldman, Papalia and Olds 2001).

Tests of Creativity

Tests of creativity on the other hand call for multiple answers to a question and novelty of such answers is an advantage. The students are at liberty to tackle the problem as they like and every possible solution provided counts. Test of creativity make a better assessment instrument for those students who are weak at memorization of facts and whose learning styles do not conform with 'say so'. All test items meant to test creative skills are high order questions but not all high order questions are creativity tests items. The difference lies in the fact that creative test items do not

~~require one single solution and the answers are not directly located on the pages of~~ teachers' notes or textbooks, Creative thinkers seek for alternative (Gay 1992). The students are required to handle the problem from their wealth of knowledge and experiences.

For instance while achievement test asks question such as; give examples of living and non-living things, test of creativity item will require: write down from where you live the living things that disturb you and your people around much.

As soon some scholars argue in favour of tests of creativity others are still in doubt of the validity and reliability of the scores arising from them in predicting achievement. It was argued that for tests of creativity to be seen as reliable instruments of educational measurement, their scores should correlate well with other measures of creativity (Wikipedia 2010).

Difference opinions maintained that creativity scores should be uncorrelated with achievement test scores but should correlate perfectly with real life practical setting (Thorndike and Hagen 1971). Although there had been research works to prove or disprove the ideas, but the debate is till inconclusive.

Wikipedia, the free encyclopedia (2010 update) reported measures of creative achievement through self-reporting questionnaire and the results were valid and reliable when compared with independent evaluation of creative output. In a different investigation creativity scores were found to have positive but low correlation with achievement test scores (Egbule 2002). It is clear that amidst these conflicting views, authenticity of tests of creativity as a proven instrument of assessment and their introduction into the educational system were still in doubt. This was why this writer wished to contribute to the process of proving or disproving tests of creativity as worthy instruments for assessment of learning outcomes. The writer strongly believed that through tests of creativity inventors that are needed to change the nation's present consumer status to producer economy will emerge.

The purpose is to give test of creativity based on integrated science and to compare the scores with the students' performance scores in mathematics arising from achievement test given by the teacher. This will give information about creativity across subjects. Integrated Science and Mathematics are among the compulsory subjects done by every student in Junior Secondary School Level. It is possible to get students to write test on them.

Method

This investigation is a survey involving 240 Junior Secondary School Students who were in part three (JSS III) during the 2009/10 academic year. Two, out of seven Junior Secondary Schools in Owerri Municipal Council of Imo State were involved. The schools were purposely chosen to make for uniformity since they are known as model schools. Students who attend these schools are those who made 50% and above

~~*The Intuition*~~ in the state common entrance examination and who took a second selection test called model school examinations. It is from the results of the second test that the successful candidates are admitted.

There were 50 students per stream and each class – JSS 1, 2 and 3, had streams that ran from letters A – L giving rise to a total of 600 students in JS III per school. Ability grouping was maintained in the two schools which necessitated the use of random sampling method. Test of creativity in Integrated Science developed by Ogomaka and Offor (2008) was adopted. The test was developed to appraise six different attributes of creativity – fluency, flexibility, divergent thinking, originality, creativity and elaboration. Each attribute constituted a section with the accompanying test items meant to appraise it. The test instrument was trial tested, factor analyzed and ascertained to have the reliability index of 0.77.

Since the study is interested in highlighting the skills of originality fluency, flexibility and Elaboration the items that appraise them were extracted and used.

Administration: Prior arrangement was made with school management and the subject teacher for integrated science to obtain convenient period within the second term examination sessions. The students were informed that the test was from Secondary Education Management Board and the result will be used for scholarship. They were also made to understand that the test will be taken in batches such that those who were not included in the first batch will be involved in subsequent batches. These were done to capture the attention of the sampled students since not all of the students were selected.

It was not a speed test because speed is not an overriding factor in creativity (Feldman, Papalia and Olds 2001). Moreso, recall and articulation of facts in real life setting is not all the time automatic. There was a no announcement of time once the test started. Time was liberalized in that students were allowed too freely hand in their answer sheets. These measures were taken to eliminated tension and anxiety. Students were to supply as many answers as they can think of for each question.

Scoring: Scoring was done based on William scale as given by Brady (2001). Marks were awarded on four premises as follows:

Fluency- the total number of interpretable, meaningful and relevant ideas generated in response to the question. For instance question lie; mention the irreversible changes that happen around you; give reasons why clothes spread at the same time under the same weather conditions do not dry at the same time. Score on these questions depend on the number, uniqueness and variety of effective solution proffered.

Flexibility- score on flexibility was based on number of categories or varieties of answers. For example goat, pig, dog etc. given as living things that disturb at one's living environment belong to one category of answers because they are all animals. If

the student mentions say mosquitoes, quarelling neighbours etc. the answers would have been diversified.

Elaboration- means to show more details, further explanation and understanding as in explain further, living things die, our bodies die but man lives on and on. The students were required to explain the statements n many possible ways.

Originality-the newness or uniqueness of the responses. Ideas that are seemingly crazy but relevant are important here. What does ironing do to clothes? Was one such question that demands a creative mind to include that ironing weakers the fabrics and kills germs.

The score of the students in the test west a simple average of their performance in the sections of the test. Students’ creativity test scores were correlated with their scores in mathematics achievement test taken by the students in that second term examinations.

Research Questions

The following research questions guided the study

1. What is the distribution of students performances in the tests?
2. What is the student score in the Integrated Science test of Creativity (ITC)?
3. What is the students’ mean score in the Mathematic Achievement Test (Mat)?
4. What is the correlation coefficient of the students’ scores in the MAT and ITC?

Hypothesis

H₀₁: The correlation coefficient is not significantly different from zero (P<0.05)

Date Analysis Methods included percentages, means and correlational statistics.

Results

Table 1: Distribution of Students’ Performances in the tests

Category of Performances	Number	Percentage
Scored high (45% and above) in MAT and ITC	56	23.3
Scored high in MAT but low (below 45%) in ITC	139	57.9
Scored high in ITC but low in MAT	27	11.3
Made low scores in both MAT and ITC	18	7.5
	240	

Table 2: Students Performance in Terms of Means and Standard Deviation, Results of Correlation and Tests of Significance

Test Type	X	Sd	Rxy	teal	t/crit	N
MAT	57.4	6.08	0.37	4.68	2.009	240
ITC	48.3	10.25				

From the data in table 1 it can be seen that 56 of the students scored high (45% and above) in the two tests representing 23.3%. Those who scored highly in MAT but had low score in ITC were 139 in number representing 57.9% 11.3% of the students had high scores in ITC but low in MAT while 7.5% made low scores in both MAT and ITC.

In table 2 the mean scores of the students in mathematic Achievement Test (MAT) and Integrated Science Test of creativity (ITC) were 57.4 and 48.3 with their corresponding standard deviations of 6.08 and 10.25.

The correlation coefficient of the students' scores (X) in MAT and in ITC (Y) was ascertained to be 0.37. The test of significance conducted on the correlation coefficient using t-test of significance showed that the coefficient is significantly different from zero at the alpha level of 0.05. This is because the teal is greater than the t-table.

Discussion

The differing performance of the students in the two tests can be explained by the views of encyclopedia Americana which looked at intelligence as any kind of behaviour that is best defined by the tests that most reliably sample it. It means that the creative ability of the students can most reliably be sampled by test of creativity. The implication is that while the two kinds of tests, MAT and ITC are good measures of intelligence. The differing students' performance in the creativity and achievement tests depicts that some are more creative than others. For while achievement tests tell more of how much the students have learned, tests of creativity talk more of application of what had been learned. While everyone is creative to some extent (Chauhan 1985) there are students who are more endowed in the area of creativity than others. Development of our nation depends on these set of students who are highly creative and can do the nation proud by the use of their hands and brains. Those who scored highly in both tests can be likened to the first group of the Wallach and Kogan study (Morris 1976) who scored highly in both intelligence and creativity tests. And they were found to be those who were able to perform well in both free and controlled situations. This group of students were also described in

Getzels and Jackson's study (Morris 1976) as being conscientious, careful and self-controlled. Their personality and career seemed to match with those of their teachers.

- Dr. Elizabeth I. D. Offor

Those who scored highly in MAT but low in creativity had been described as those who place high value on achievement in school and work hard to excel in their studies. On the other hand, those who were high in creativity but low in achievement tests were mostly frustrated in the school environment but were able to do well in a freer setting (Feldma, Papalia and Olds 2001). Their personality dispositions according to Getzel and Jackson's study were described as playful, expressive and independent. They do not get on well with their teachers because they are always busy doing more than they are expected to do. Those who scored lowly on both tests were described as those who tended to avoid school work and either concentrated on social activities or displayed regression or psychosomatic symptoms (Morris 1976).

The students can be said to have done better in MAT than in ITC going by their mean scores in the two tests, 57.4 and 48.3. This should be so because highly creative students are few. According to Uzoma (2004) highly endowed persons constitute 2-6% of any given group. Individuals differ in their levels of creativity as confirmed from the large size of standard deviation, 10.25 for test of creativity. Ogomaka and Offor (2008) drew sample of two thousand students and gave them test of creativity. Results showed that 60 students representing 3% made 60% and above in the test. However, the students were not yet familiar with test of creativity and it is not certain whether they were taught creatively.

A positive correlation coefficient of 0.37 which was ascertained to be significantly different from zero indicated an appreciable relationship between the two tests. This shows that the ability to respond to any kind of stimulus (test) is controlled by one common factor of intelligence. This agrees with the Spearman's factor 'g' theory which holds that all intellectual activities share one common general factor called V factor from which other numerous Y factors that are more specific in function branch out. The theory affirmed that Y factors account for individual differences in intellectual functioning (Thorndike and Hagenz 1971). No wonder Kaitholil (2005) argued that the creator has programmed every human being to be self-creating, self-training, self-developing and self-perfecting. Therefore he continued the principal agent of one's creativity and progress is oneself. Surely, there will be greater correlation by the time the students get more familiar with tests of creativity following their introduction in our school system. This result which is not far from the result of earlier research works cited in this study proved that test of creativity is a reliable instrument of educational measurement.

The faith in achievement test over the years has really not helped us to improve students' skills rather examination malpractice, quest for certificate acquisition without skills and the like have been enthroned. The time is now for reforms in educational assessment programmes. Delay is dangerous.

Conclusion

This study was undertaken to ascertain the functionality of tests of creativity that were meant to run concurrently with achievement tests in school assessment. The achievement tests which have been in vogue over the years have not helped much in achieving the desired aim of technological advancement. A sample of two hundred and forty students were made to write both achievement test in mathematics and tests of creativity in integrated science. The percentages of the students who did well in each of the tests were identified. The coefficient of the correlation of students' scores in the two tests was positively low but encouraging. Part of the findings included;

- Students can write test of creativity
- Highly creative students can be explored through test of creativity.
- Some students are good in both achievement tests and tests of creativity
- Some students may be intelligent but not necessarily creative.
- Test of creativity can operate in concert with achievement test to make assessment complete.

Based on these findings the following recommendations were possible.

Recommendations

1. Tests of creativity should be introduced in school considering the importance in making Vision 20: 2020 a reality.
2. Given that creative students need freedom to perform, a separate building should be provided where they can go to and become free from rigidities of the school time tables.
3. A different investigation involving larger area and sample will be worthwhile.

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