EFFECTIVE EVALUATION OF PRIMARY SCHOOL MATHEMATICS: REMEDY TO CHALLENGES IN HIGHER EDUCATION MATHEMATICS

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Abstract

The paper thrusts on effective evaluation of primary Mathematics as a remedy to overcoming the challenges in higher education mathematics. Effective evaluation is geared towards worthwhile decision making process. The study was a quasi experiment which involved two randomized groups. The study was carried out in Ehime Mbano in Imo State Nigeria. The population of the study was 65 primary 5 pupils and the sample was 40 pupils, 20 for group A (Creativity approach group) and 20 for group B (Traditional approach group). There were 10 items which were validated by experts. K – R formular 21 was used to ascertain the reliability index of the items and the index obtained was 70. The two null hypotheses were rejected. The creativity approach group, performed better than the traditional approach group. The researchers recommended that effective evaluation of Primary school Mathematics should be ensured to enable evaluators bring in creativity during programme and curriculum evaluation among others as a guide to remedy challenges faced by students in higher education Mathematics.

Keywords: Effective Evaluation, Challenges in Higher Education.

Educational evaluation are steps involved in making sound and worthwhile decisions based on several attributes in students. Good and qualitative information are normally used "to make valued judgments through measurement processes. Measurement itself is an organized pattern of assigning numerical values or quantities to aspects or attributes of objects according to some lay down rules. Thus, Evaluation is a worthwhile decision making process so as to give value judgment. Several decisions that are being numerous in nature are taken in education from time to time. These decisions are issues that concern programmes and progress of students. Evaluation as a matter of necessity should be valid inorder to ensure that right and accurate decisions are made. Tests are useful and vital instruments which are normally employed in making value judgments in education. Evaluation could be said to be prognostic or diagnostic. When evaluation is prognostic, it is used to predict what an individual or person will be able to do or achieve in future. This means that it is predictive in nature and therefore can be called predictive evaluation. The strength and/or weakness of the testee could be found or determined using diagnostic evaluation. It could be used to reveal the extent of learning students have had or what they do not know about a learning content or subject matter. This is to ensure that provisions are made to remedy the deficiencies or short falls or inadequacies of testees. Tests that satisfactorily meet this requirement serve diagnostic purpose. This therefore means that various forms of evaluation techniques such as readiness or placement evaluation (pretesting), formative, including diagnostic, testing itself will serve for diagnostic purpose (Iwuji, 2007). When evaluation is done for a diagnostic purpose such as to place them into various vocations or programmes, equal opportunities for all children (no matter their genetic and environmental variations) is achieved. This helps to integrate various pupils with numerous potentials as well as serving as a check or measure against dropping out of school. Proper use of diagnostic evaluation will enable the pupil or child not to see the society as his enemy any more, if in the previous times he has been having that negative attitude. The child that is properly diagnosed will also not regard his teachers and peers as his "worst enemies" or the reason for his being a dropout. The child through diagnosis will therefore properly fit into his society since he has been adequately and properly provided for in his learning environment or school. The child will now become socialized and adjusted with other people across the various segments/strata of the society. Evaluation is the end point of measurement (Nwana, 2007) and provides remedial measures to students who may resort to anti-social behaviours. In Nigeria different agencies/organizations/establishments value certificates irrespective of the capability of the holders(s) of such certificate(s). Certificates are also the modes of admission into higher institutions of learning, employment opportunities etc. Students may do all they could to pass examination so as to have the certificates.

Evaluation ensures that adequate techniques such as continuous assessments and school based assessments are properly undertaken and conducted so as to ensure

that pupils from diverse origins and backgrounds will be duly accommodated and taken care of. Value judgments are made about the test scores of pupils and according to Iwuji (2007), these valued judgments are remarks like poor, good, pass, fail, bright, dull etc. Pupils who normally perform poorly and usually get negative remarks like dull, lazy, weak, incompetent etc. may brand themselves "never do well" and will develop low personality esteem. This can cause them to become dropouts, leading them to hating themselves, their peers, parents, teachers and society at large. To prevent these dangers, educational evaluation is properly utilized to prognose, diagnose and place every child so that he can discover his potentialities, areas of interest and career choice so that he can have personality value for himself. Effective evaluation of primary school mathematics will give the child enough background that will prepare him for future challenges in the subject.

Challenges in Higher Education Mathematics

Mathematics, as a core school subject poses a lot of challenges to both pupils and students at various levels of education. Many pupils do not feel comfortable with Mathematics, and therefore develop phobia or have negative attitude towards it. At the higher education level, students most of the time frown at Mathematics and Mathematics – related disciplines and therefore refuse to opt for such courses and where they do so, the performances recorded at the end of the programmes are not quite encouraging. It could be that they were not properly equipped at lower levels, emanating from lack of interest and seriousness as well as poor instructional approaches procedures by both teachers and authors of recommended textbooks. Where these exist, there is strictly lack of coherence coupled with inadequacies to offer needed explanations on the existing problems. According to Obi (2015), a lot is needed on the part of both teachers and learners to remedy the situation. To this end, higher education Mathematics must as a matter of urgency be given due and adequate treatment through provision of necessary instructional guides and strategies by teachers to pupils in order to eliminate or at least reduce to minimum the poor performances being experienced in Mathematics and its allied/cognate disciplines at higher education.

According to Ogbugh (2004), a house without a solid foundation will easily have cracks on its walls and eventually collapse under heavy loads. This is the experience teachers of Mathematics have in institutions of higher learning. According to him, many students come into the University, Polytechnic, Colleges of Education, etc. to read courses or programmes that involve advance Mathematics but they have poor and weak background in it. If the causes of the weakness are not corrected, they find the programmes very uninteresting and difficult. Remedies should therefore be provided to students in higher education at earlier stage so as to achieve maximum manpower development in such areas of learning.

Ogomaka (2002) opined that higher education students most of the time honestly and conscientiously undertake problem solving in Mathematics but majority of the students make their efforts less rewarding and of less consequence because of the way and manner they were poorly brought up. Adeniran (2013) was of the view that numeracy and the ability to function properly should be inculcated in the child early in life to prepare him for future challenges. Hearne, (2004), expressed that the child's present mental ability in mathematics should be directed towards enhancing what he will be able to do later in life. While Channon, Smith and Head (2007) were of the opinion that fundamental Mathematical upbringing will catalyse into adequate preparedness of the pupil for future Mathematics challenges.

Effective testing for evaluation could be carried out in several areas of Mathematics such as primary school geometry. Thus, items could be developed in geometry as follows:

Find the sizes of the lettered angles in problems below:

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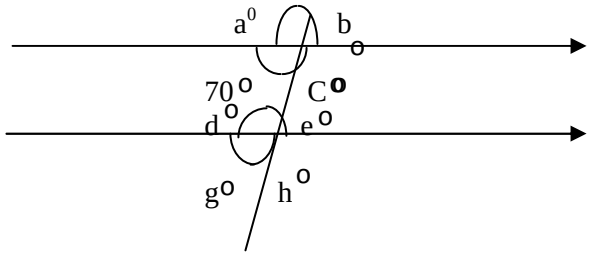

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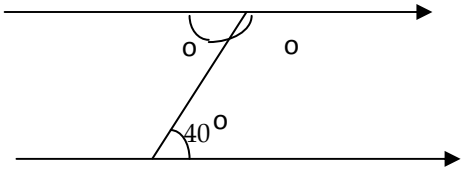

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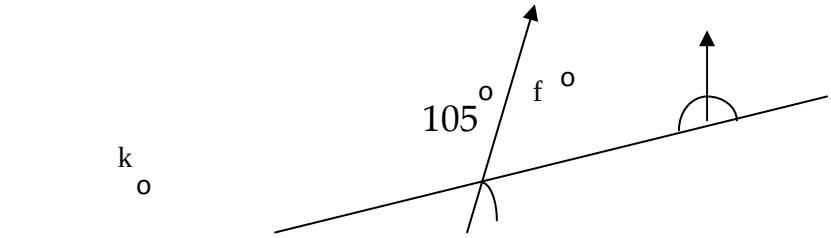

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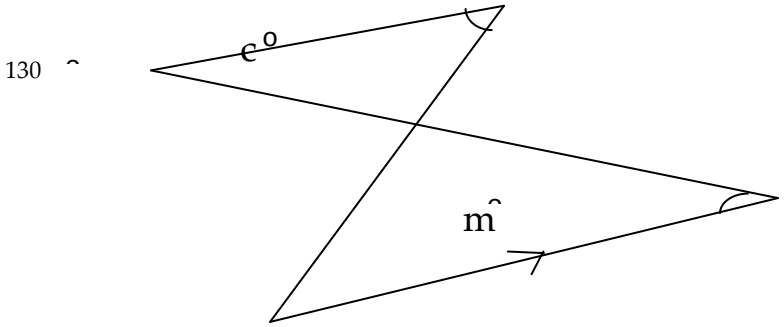

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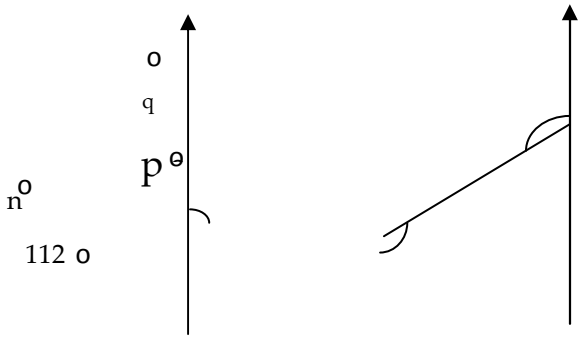

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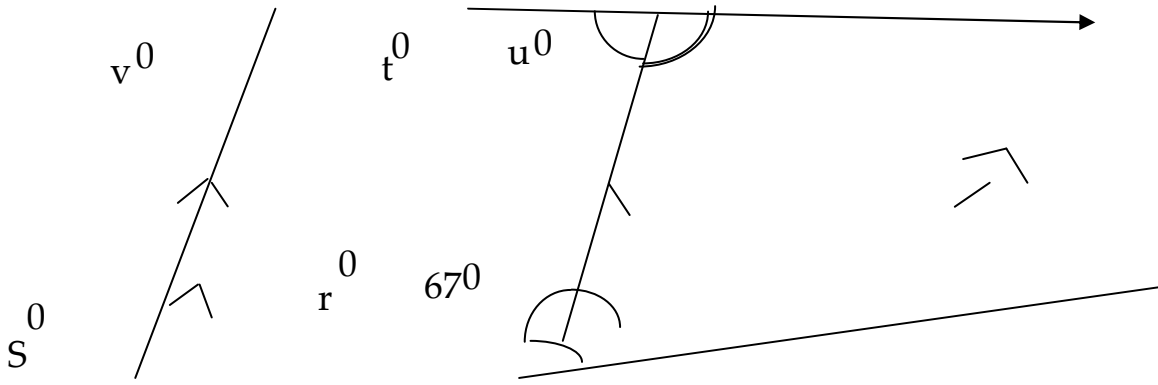

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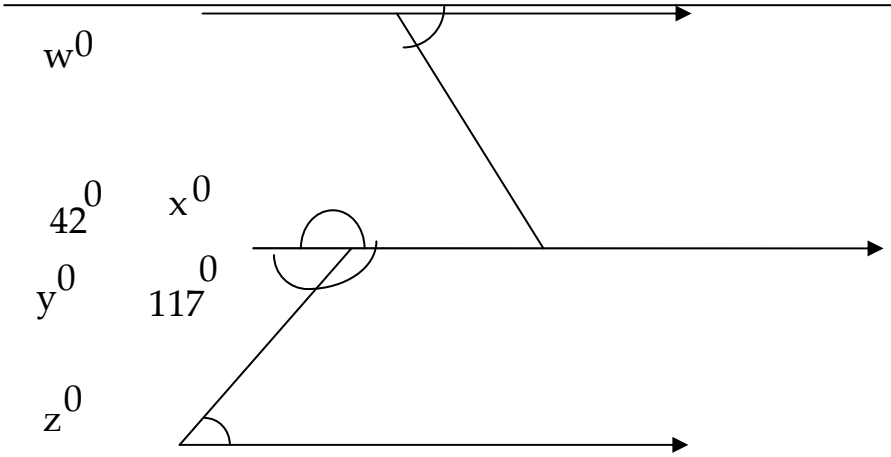

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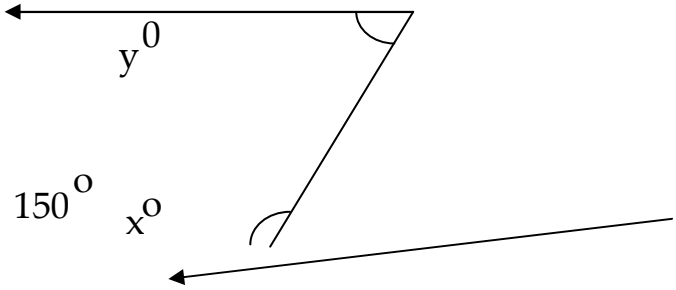

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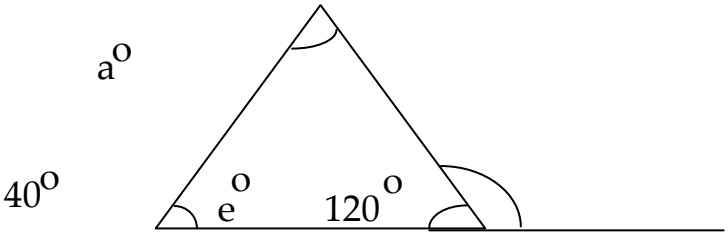

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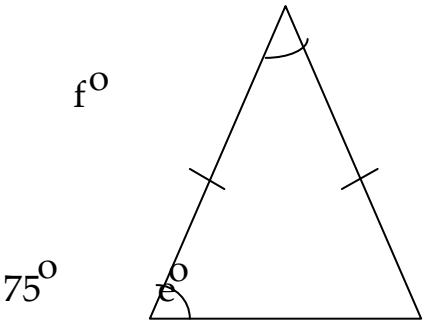

The statements used to assign values to variables during programming are called assignment statements (Egbe, Odili and Ugbebor, 2000).

Statement of the Problem:

Mathematics as a core and compulsory subject at the basic educational level (from primary 1 to Jss3) up to Senior Secondary 3 (SS 3) has over the years posed serious challenges to learners of various age groups which has eventually affected in no small way their performances at higher education level. This difficulty could stem from lack of seriousness and interest on the part of the learners leading to poor performances (inherent in low ability) in the subject. It could also be as a result poor motivational technique which educational stakeholders fail to render to learners for better assimilation of the subject. Another possible reason to this could be lack of adequate instructional strategy which the teachers fail to provide to the learners most of the time. Some Mathematics teachers lack the prerequisite qualifications and necessary skills to impart knowledge on their learners. Inadequate provision of instructional materials such as standard Mathematics textbooks, poorly improvised instructional materials, poor mathematics laboratories among others have also contributed to poor performances on the subject. Lack of co-operation from learners during instructional procedures as well as poor evaluation approaches have all contributed to poor and faulty mathematics foundation at lower levels and as a result, the aching difficulty experienced at higher levels of education among students of the subject and its related disciplines. Could the adequate employment of effective evaluation procedures by classroom teachers at the foundational levels (such as the primary school level, help to remedy the problems experienced by students at the higher level of education? Could the teacher (at this lower level of education bring in creativity during instruction and evaluation of the pupils to ensure the needed evaluation effectiveness so as to bridge the gap between foundational education Mathematics and higher education Mathematics?

Scope of the Study

The area of Mathematics in which 10 essay type quantitative reasoning (Etqr) are set is geometry of made basic Mathematics.

Purpose of the Study

Generally, this study aims at ascertaining which of the traditional/routine/ conventional approaches (creative/new idea /original idea approach to evaluation of primary school pupils) in Mathematics will produce better results with regards to cognitive performances in geometry.

Specifically the Researchers

i) Ascertained the mean cognitive performance scores in primary school geometry of two groups of pupils.

ii) Tested if the mean scores (x)s of the two groups of pupils differ significantly.
iii) Ascertained the variance of cognitive performance scores in primary school geometry of the two groups of pupils.
iv) Tested if the variances of the scores of the two groups of pupils differ significantly.

Research Questions

The researchers formulated the following research questions to guide the study:

1. What are the Mean Cognitive Performance, scores (X) of the two groups of pupils evaluated based on traditional approach and creativity approach of solving primary school mathematics?
2. What are the variances of the cognitive performance scores of the two groups of pupils evaluated based on traditional approach and creativity approach of solving primary school mathematics?

Hypotheses

The researchers formulated the following hypotheses to guide the study:

HO_1: The mean cognitive performance scores (x) of the two groups of pupils do not differ significantly at α - level of 05.

HO_2: The variances of the cognitive performance scores of the two groups of pupils do not differ significantly at α - level of 05.

Significance of the Study

The study is considered significant because: the result of the study will add to the existing body of knowledge on the need and importance of creativity to problem solving in the evaluation of primary school mathematics. The study highlights the main effects of creativity in the evaluation of primary school mathematics. The study would help evaluators to give the required consideration to creativity during school and programme evaluation.

Education authorities such as school supervisors will realize the role of creativity in the effectiveness of evaluation in teaching and learning.

Mathematics teachers will see the need to bring in creativity in teaching and learning to enhance better understanding and effective evaluation of pupils.

The study will help evaluators to give consideration to creativity during school and programme evaluation to ensure the required effectiveness.

Design: The study is a quasi experiment. It involves manipulation of independent variable and watching its effect on the dependent variable, without controlling all the intervening variables of the randomized groups.

R_1 X O
R_2 X O
Where R = Random group
X = Treatment
O = Post test

Population: The population was made up of 65 primary 5 pupils in Ehime Mbano in Imo State, Nigeria.

Sample and Sampling Technique: The sample for the study was 40 pupils, 20 for group A and 20 for group B. The sampling technique was systematic random sampling.

Instrument for Data Collection: Essay type test items ($Etti_s$) were used. There were two sections, sections A and B. There were 10 items in all.

Validation of Instrument: The items were validated by five experts of educational Mathematics, Measurement and Evaluation. The experts read through the items to ensure the correctness of expressions, the appropriateness of tasks/exercises and the correctness of the solutions. A test blue print was developed to ensure content validity.

Reliability of the Instrument: The reliability of the instrument was done using Kudder-Richardson (K-R) formula 21 and the index obtained was 70. This was to ensure that they exhibit the degree of consistency they are expected to.

Table 1: Test Scores of the Two Groups of Pupils

Group	**Scores**	**Total**	**Mean ($\bar{X}$)**
Creativity Approach	65, 55, 59, 61	1200	60
Group A	53, 67, 70, 50		
	40, 80, 45, 75		
	30, 90, 70, 50		
	72, 48, 69, 51		
Traditional Approach	50, 54, 48, 56	1040	52

Group B	60, 44, 64, 40
	30, 74, 34, 70
	49, 55, 47, 57
	61,43, 63, 41

Mean Score $\overline{X}$ for group A (Creativity approach Group)

$= \frac{1200}{20} = 60$

Mean Score X for groups B (Traditional Approach Group)

$= \frac{1040}{20} = 52$

$S_A^2 = 10.1 \qquad S_A^2 = 5.6$

$n_A = 20 \qquad n_B = 20$

$$t_{cal} = \sqrt{\frac{60 - 52}{\frac{[20(10.1) + 20(5.6)]\ (20+20)}{(20+20-2)\ 20x20}}} = \frac{8}{0.9043} = \mathbf{8.85}$$

$\therefore t_{cal} = 8.85$

Result

Table 2: t – test Statistics Summary Table

Sample sizes (n), means (X), standard deviation (S^2) calculated t – test statistics (t_{cal}), degrees of freedom (df), tabulated – test value (t_{cal}) and decision.

Sample	**N**	$\overline{X}$	**S**	t_{cal}	**df**	t_{tab}	**Decision**
Creative Approach Group A	20	60	10.1	8.85	38	2.02	Significant $H0_1$ rejected
Traditional Approach Group B	20	52	5.6				

The results of the table shows that both groups have sample size of 20 each. The mean score for the creativity group was 60 while its variance was 10.1. While the mean score for the traditional group was 52 and its variance was 5.6. Null hypothesis was rejected because significant difference existed between the two groups. The creativity group performed better than the traditional group.

Table 3: F-test for Variance Summary Table

	S_A^2	S_B^2	F_{tab}
S_A^2	1.00	1.80 Significant $H0_2$ rejected	1.69
S_B^2	1.80 significant, $H0_2$ rejected	1.00	1.69

The results of F-test for variances show that the tabulated result was lower than the calculated result, leading to the rejection of null hypothesis. Significant difference existed between the two groups. The creativity group performed better than the traditional group.

Discussion of Result

The results show that the mean performances and variance of the creativity approach group differ significantly from those of the traditional approach group. Null hypotheses were rejected, showing that the creativity approach group with a mean score (x) of 60 and variance of 10.1 performed better than the traditional approach group with a mean score (x) of 52 and variance of 5.6. This agrees with the findings in this work that creativity stipulates and aids in newness of idea and better performances

Implication of the Study

The result of the finding show that some pupils can perform specific tasks more successfully using creative ideas than when they use the routine (traditional) ways of problem solving in primary school mathematics.

Limitation

The result of this study was limited by some constraints. The researchers were unable to assess pupils in lower basic schools and also could not assess pupils in other areas of Mathematics because the scope of this study was based on geometry of middle basic schools mathematics.

Conclusion

Much consideration should be given to creativity during instructional delivery and school programmes evaluation to enable pupils do well in primary school

mathematics and as a necessary guide for further education. This is so because the results of this study show that the creativity group performed better than the traditional group.

Recommendations

The researchers recommended that this study be carried out in different subject areas at various educational levels and that:

1. Workshops, seminars, conferences and debates on creativity should be organized from time to time by government and other relevant agencies for both teachers and pupils.
2. Pupils who distinguish themselves in creativity in Mathematics should be encouraged using scholarship awards by government and other educational stake holders as well as encouragements using other motivational facilities.
3. For school pupils should be encouraged by their Mathematics teachers and other relevant stake holders in education to bring in creativity during problem solving to enhance divergent thinking.
4. Primary schools educational evaluators should bring in creativity and innovations during school programme and curriculum evaluations.
5. Programme planners/curriculum experts should endeavour to utilize creativity during programme planning in primary school Mathematics.
6. Primary school Mathematics teachers should facilitate problem solving using creativity.

It is strongly believed that if these recommendations strictly followed, effective evaluation of primary school mathematics will be achieved and this will help remedy the challenges experienced in higher education mathematics as the pupils progress in school.

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