ACHIEVING ENTREPRENEURIAL EDUCATION THROUGH CREATIVITY IN THE EVALUATION OF PRIMARY SCHOOL MATHEMATICS

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Abstract
This paper addresses creativity and creative ability in the evaluation of primary school mathematics for Entrepreneurial Education. Creativity calls for newness and modification of existing set rules. The study was carried out in Okigwe in Imo State Nigeria. It was a quasi experiential study involving two randomized groups. The population was 130 primary 5 pupils and the sample was 100 pupils selected by systematic random sampling, 50 for group A (creative approach group) and 50 for group B (traditional approach group). The test instruments consist of 10 essay type items. The items were validated by experts in relevant field. The reliability of the instruments was done using K-R formula 21 and the index obtained was 0.74. Data were analysed and results obtained. The two null hypotheses were rejected. The creative approach group performed better than the traditional approach group. The researchers recommend that educational programme planners and evaluators should bring in creativity as a functional tool to achieving objectives of entrepreneurial education among others.

Keywords: Entrepreneurial Education, Creativity, Evaluation.

Entrepreneurial Education is the provision made for learners so as to enable to acquire knowledge, skills and motivation to encourage them succeed in a variety of settings. Entrepreneurial Education facilitates mental development geared towards ingenuity of mind for self actualization (Obi, 2005). Entrepreneurial Education aims at skill development or attributes for the realisation of opportunity. It all involves opening a new organization such as starting a new business as well as venture creation programme (VCP). Pupils should be taught to launch a new programme as an integral part of the learning process, (Miron-shatz 2014). Entrepreneurial Education can be promoted through innovation or introduction of new strategies to solve existing problems for the enhancement of skills towards capacity building for self actualization.

According to Obi (2005), this capacity building when extended to primary school pupils through adequate instructional procedures and curricula innovation and provision will help to enhance tremendous achievement in the area of ingenuity as they progress in life. If, this is properly articulated and executed, it will help the citizenry and place the economy of the nation on a sound footing. Entrepreneurial Education is and ought to be given a top priority in the nation’s educational curriculum of primary education.

Mathematics is a discipline/subject as well as a tool for service function of other subjects/education areas including subject areas involved in Entrepreneurial Education. Mathematics, as important as it is, should be adequately taught early in life to enhance proper mental development of primary school pupils to enable them to undertake proper manipulations of ideas and processes. Thus mathematics forms an aggregate whole or coordinating point of realization of objectives of entrepreneurial education in real life or practical terms.

There are human attributes which facilitate creativity and new problem solving.
strategies among pupils learning Mathematics. The school as a social institution charged with the duty of moulding the character of pupils, does a lot to develop problem solving abilities in school children. The classroom teacher has several strategies at his disposal (owing to creativity) to encourage his pupils to learn how to solve problems in general and specific situations using new ideas and concepts.

Creativity is the ability which an individual possesses to formulate, originate or discover new ideas or ways of carrying out/performing specific tasks successfully. It is a synthetic combination of realistic and imaginative thinking which most of the times result in novel and unusual ways of solving problems. Creativity lends itself to individuals (irrespective of areas of human endeavour) as the ability to go beyond the normal or conventional rules to find out unique and original solutions to problems at hand, (Ogwudire, 1997). Creativity could see a teacher sharpening and brightening up a pupil who has been labeled “dummy” by every other teacher and fellow pupils. Creativity could also illuminate and ignite a footballer to score an unsuspecting winning goal when all hopes were almost lost. Over the years, scientists (due to creativity) have worked on and invented new devices such as equipment, gadgets, vaccinations, therapies, drugs etc for healthy upkeep and advancement of mankind and the society. According to Ogwudire and Iroegbu (1997) a number of human factors facilitate creative efforts. They include: redefinition, divergent thinking and sensitivity to problems.

Redefinition: The creative individual throws away old existing ideas and develops new ways of looking at the same variables. This is contrary to convergent thinking whereby a person is stagnated to old and already existing ideas.

Divergent Thinking: This gives rise to flexibility of thought, novelty in concepts oratory prowess (fluency in speeches) ideas and collaborations. Divergent thinkers aggregate what seemed to be useless pieces of information into meaningful mental deposits. Their originality and uniqueness are always outstanding.

Sensitivity to Problems: Problems and problem-causing situations are natural phenomenon. A creative individual assesses/evaluates the content of a problem and makes useful inferences that a solution is needed for it and he goes on to develop steps towards the solution. He does this through intelligence and past experiences which may enhance quick and accurate solution.

The development of creative ability is essential for pupils to do well in primary school Mathematics. According to Ogomaka (2014), formal education affords pupils (as they progress in school) basic mental operations in Mathematics which they need to solve immediate academic problems, translate the ideas into solving problems in their surrounding and develop career-related skills. According to him, teachers should endeavour to facilitate creativity in the teaching and learning of Primary School Mathematics. To do this, they should adopt various instructional devices and leadership roles which ensure democratic climate and encourages independent thought and work, originality, initiative and divergent thinking among pupils learning Mathematics. The Primary School Mathematics teacher (to enhance creativity) should also encourage freedom of expression in the classroom for a democratic atmosphere. He should also adopt various instructional devices and leadership roles, which according to Nwana (2007) should ensure democratic classroom climate and facilitate the development of creativity in primary school pupils. According to Amadi (1997), the teacher in his instructional delivery – aiding creativity (especially pupils learning
Mathematics) should adopt the project method of instruction as well as the discovery method. These give rise to independent and goal-oriented thinking as they try to discover the missing or hidden aspect of a lesson. Based on these, pupil activity and abstract thinking among others are encouraged.

Evaluation is the process of making value judgment or taking worthwhile decision about events, objects or their characteristics. According to Nworgu (1992), evaluation is a process of seeking, obtaining and qualifying data with a view of making value judgment about objects, events or their characteristics. According to Ogomaka (2014), evaluation may be based on objective or subjective pieces of information. According to him, evaluation is a worthwhile decision making process so as to give value judgment. What is evaluation? According to Nwana (2007), to answer this question, we must ask ourselves what are the aims and objectives in sending children to school? According to him evaluation is the end point or product of testing, measurement and assessment. Very many decisions are made in education concerning programmes such as primary school Mathematics programme and the progress of pupils. The place and use of creativity in such evaluation would facilitate the use of strategies by different pupils who are likely to show themselves as possessing individual differences in the rapidity and ease with which problems are identified and solved. Creative pupils adopt unique cognitive strategies; hence they produce original strategies and approaches for arriving at the solution of any problem in a such shorter time frame.

The enhancement of the self esteem or self-worth of pupils can be achieved through appropriate motivational and reinforcement techniques like praise or reward for achievement. According to Obi (2005), when pupils are adequately motivated and challenged, they usually devise varied and unique techniques that help them to study effectively and excel in a given assignment or test. In his contribution, Anusiem (1994), wrote pupils’ awareness can be enhanced by inviting creative persons in different fields to talk to them on various issues related to career development. Organised class-visit to creative persons could serve too. According to him, including open-ended questions in school examinations help to generate creative thoughts in the pupils and by so doing some forms of examination malpractices are eliminated. According to Ogwudire and Iroegbu (1997), factors that inhibit creativity include: Rigid and convergent teaching methods which are likely to produce robots and strict conforming pupils, poor self concept or self esteem which makes self expression difficult. This may result from a record of failure in the past. Also include autocratic, authoritarian or restrictive family or classroom atmosphere which instills fear and uncertainty in children, make them less creative and adventurous. Such pupils, according to them are poor learners and may eventually become low achievers who score below average in school examinations. Other factors impeding creativity include poor environmental stimulation which stifles imagination and original thinking in children. Lack of instructional materials, teaching aids or audio visual aids at the appropriate level does not stimulate creative thoughts. Over dependent and conforming behaviors among learners are not helpful to creative imaginations. These two behavior patterns and their like often arise from domineering parental and teacher influences. Poor achievement, motivation and fear of failure or fear of adventure rob children of creative initiatives.

In order to effect creativity in the evaluation of primary school Mathematics, the teacher in his instructional delivery should ensure he brings in a creative flowchart approach called a schematic representation by Enukoha (2010).
Lesson study Approach

- Plan lesson
- Observe lesson in action
- Discuss lesson plan

Adequate
- Teach
- Share reflection
- Welcome new ideas/strategies
- Help put new strategies into work
- Reward effort made for new strategies

Inadequate
- Revise
- Teach the new lesson
- Share
- Welcome new ideas/strategies
- Help put new strategies into work
- Reward effort made for new strategies

Teacher/Evaluator
The task of developing creativity learning web/model network for effective learning of Mathematics belongs to the teacher.

The primary school Mathematics teacher in his/her effectiveness should develop good ways of evaluating/finding out what his/her pupils have learnt from the experiences organized for them. This may be presented in a model as modified by Obi (2005):

Solve the following algebraic expressions:
1. If \( x = x - 5 \) find \( x \)
2. What value of \( x \) that makes \( 24 = 8 \)?
3. If \( x - 10 = 10 \) what is the value of \( x \)?
4. If \( 6x + 7 = 55 \), find \( x \)
5. The smaller of two consecutive numbers is doubled and added to the greater. If the smaller number is \( n \), what will be the total?
6. \( \frac{a}{3} = \frac{1}{2} - 2a \)
7. \( \frac{4n - 3}{5} = \frac{17}{2} \)
8. Two consecutive whole numbers are such that twice the smaller added to the greater make a total of 52. Find the numbers.
9. A packet of candles and a box of matches cost 420. The candles cost 20 times as much as the matches. Find the cost of the matches.
10. A number, \( x \) is multiplied by 3; 5 is subtracted from the result. The final answer is 16. Make an equation in \( x \) and find the value of \( x \).

The classical test theory (CTT) is used to determine creativity in a test. Classical test theory (CTT) stipulates that an individual learner who is better than the other also answers correctly any test item which the other individual gets correctly (Ogomaka, 2014). The objectivity level of the creativity of pupils in a test may be improved by letting a number of experts to be involved in their determination. In such a situation a relevant measures of central tendency of the creativity of test items determined by experts will be an improvement.

The items above call for quantitative reasoning. Traditional approach of solution may limit pupils performances. This is where creativity is needed to enable pupils to brainstorm the items in the exercises. Creativity in problem solving in Mathematics facilitates adequate mental development and ability in the child (Ilori, Okunmuyide, Mohammed and Okechukwu, 2010).

This situation is adopted in this study. The experts used here are five in number so the median of their rating scores to an item is used.

**Statement of Problem**

To determine the properties of the test following the classical test theory (CTT), would imply the use of a set of pupils who are not members of 1000 or 2000. Yet the determination of item properties through CTT approach is faulted since such properties are said to be group dependent.

The determination of creativity estimate \( \theta \), using logistic curve of item response theory IRT is highly demanding. For an achievement test mean for a group of testees less than 1000 or even 2000, it is a waste of time to and also not in conformity with the use of logistic curves. Could the employment of creativity in problem solving and evaluation in primary school Mathematics offer better articulation among pupils and teachers towards achieving objectives of entrepreneurial education?

**Scope of the Study**

The area of Mathematics in which 10 essay type quantitative reasoning (Etqr) are algebra of senior primary school (basic) Mathematics.

**Purpose of the Study**

Generally, this study aims at ascertaining which of the traditional/routine/conventional
Specifically the Researchers

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

ii) Tested if the mean scores (x) of the two groups of pupils differ significantly.

iii) Ascertained the variance of cognitive performance scores in primary school algebra 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:

HO₁: The mean cognitive performance scores (x) of the two groups of pupils do not differ significantly at α - level of 0.05.

HO₂: The variances of the cognitive performance scores of the two groups of pupils do not differ significantly at α - level of 0.05.

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 give required consideration to creativity during school and programme evaluation of entrepreneurial education curriculum among pupils.

Education authorities such as school supervisors will realize the importance of creativity in teaching and learning in entrepreneurial education. Mathematics teachers will see the need to bring in creativity in teaching and learning to enhance better understanding in entrepreneurial education.

The study will help evaluators give consideration to creativity during school and programme evaluation of entrepreneurial education.

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.

R₁ X O
R₂ X O

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

Population

The population was made up of 130 primary 5 pupils in Okigwe in Imo State, Nigeria.
Achieving Entrepreneurial Education through Creativity in the Evaluation of Primary School Mathematics

Sample and Sampling Technique
The sample selected was 100 pupils, 50 for group A and 50 for group B. The sampling technique was systematic random sampling.

Instrument for Data Collection
Essay type test items (Etti) were used. There were two sections, sections 1 and 2. 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 blueprint was developed to ensure content validity.

Reliability of the Instrument
The reliability of the instrument was done using Kuder-Richardson (K-R) formula 21 and the index obtained was 0.74. This was to ensure that they exhibit the degree of consistency they are expected to.

Table 1: Test Scores of the Two Groups of Students

<table>
<thead>
<tr>
<th>Creative Approach Group A</th>
<th>Total</th>
<th>Mean (X̄)</th>
</tr>
</thead>
<tbody>
<tr>
<td>76,84,82,78,70,90</td>
<td>4002</td>
<td>80</td>
</tr>
<tr>
<td>95,65,66,94,76,84</td>
<td></td>
<td></td>
</tr>
<tr>
<td>93,67,65,95,77,83</td>
<td></td>
<td></td>
</tr>
<tr>
<td>91,69,68,92,93,67</td>
<td></td>
<td></td>
</tr>
<tr>
<td>86,74,93,67,66,94</td>
<td></td>
<td></td>
</tr>
<tr>
<td>81,79,92,68,69,93</td>
<td></td>
<td></td>
</tr>
<tr>
<td>80,80,90,70,85,75</td>
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<tr>
<td>71,89,72,88,87,73</td>
<td></td>
<td></td>
</tr>
<tr>
<td>64,96</td>
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<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Traditional Approach Group B</th>
<th>Total</th>
<th>Mean (X̄)</th>
</tr>
</thead>
<tbody>
<tr>
<td>60,68,70,58,56,72</td>
<td>3208</td>
<td>64</td>
</tr>
<tr>
<td>50,78,80,48,46,82</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40,88,90,38,36,92</td>
<td></td>
<td></td>
</tr>
<tr>
<td>59,69,69,59,57,73</td>
<td></td>
<td></td>
</tr>
<tr>
<td>49,79,79,49,47,81</td>
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<tr>
<td>48,80,80,48,48,80</td>
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<tr>
<td>41,87,86,42,43,85</td>
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<td></td>
</tr>
<tr>
<td>39,89,90,38,36,92</td>
<td></td>
<td></td>
</tr>
<tr>
<td>65,68</td>
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</tr>
</tbody>
</table>

The results of the table show that both groups have sample size of 50 each. The mean score for the creativity group was 80 while its variance was 156. While the mean score for the traditional group was 64 and its variance was 68. Null hypothesis was rejected because significant difference existed between the two groups. The creativity group performed better than the traditional group.
**Table 2: F-test for variances Summary table**

<table>
<thead>
<tr>
<th></th>
<th>$S^2_A$</th>
<th>$S^2_B$</th>
<th>$F_{tab}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$S^2_A$</td>
<td>1.00</td>
<td>2.30</td>
<td>1.69</td>
</tr>
<tr>
<td></td>
<td></td>
<td>significant, $H_0$ rejected</td>
<td></td>
</tr>
<tr>
<td>$S^2_B$</td>
<td>2.30</td>
<td>1.00</td>
<td>1.69</td>
</tr>
<tr>
<td></td>
<td></td>
<td>significant, $H_0$ rejected</td>
<td></td>
</tr>
</tbody>
</table>

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 80 and variance of 156 performed better than the traditional approach group with a mean score ($x$) of 64 and variance of 68.

**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 junior primary school and also could not assess pupils in other areas of Mathematics because the scope of this study is based on algebra of senior primary school 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 and this enhances adequate realization/achieving objectives of entrepreneurial education.

**Recommendations**

The researchers recommend 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) Primary 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 school 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.
When all these are successfully carried out/put into practice, the objectives for Entrepreneurial Education of which Mathematics is a service function will be achieved.

References


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