ENHANCING THE TEACHING AND LEARNING OF SECONDARY SCHOOL MATHEMATICS USING RECREATIONAL MATHEMATICS

BY

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Abstract

Over the years, the poor performance of students in both internal and external Mathematics examinations has given worries to many scholars. This has been attributed to certain factors. Among which are lack of teachers, attitude of students, nature of Mathematics, lack of use of instructional materials, etc. In response to all these and more, specific strategies have been suggested to be remedial to the situation. In continuation to finding lasting solution to this obnoxious situation, this study focuses on enhancing the teaching and learning of secondary school Mathematics through recreational Mathematics. Recreational Mathematics is a term for mathematics carried out for recreation (entertainment) rather than as a strictly research and application-based professional activity, although it is not necessarily limited to being an endeavour for amateurs. It often involves mathematical puzzles and games. This paper looks at the inherent benefits and practical ways Mathematics can be made a recreational activity instead of something to be feared. Conclusions were drawn based on the fact that play is the birth right of every child and as such making Mathematics recreational will certainly enhance the teaching and learning of secondary school Mathematics.

Key words: Recreational Mathematics, teaching and learning of Mathematics.

Introduction

Mathematics is one of the compulsory subjects at virtually all levels of education in Nigeria - Kindergarten, primary, secondary and even up to tertiary levels of education. This is in compliance with the National Policy on Education, (NPE, 2013). This policy understands Mathematics as the foundation of science and technology, without which, a nation can never become technologically advanced. This is why Okpala (2008) recognized science, technology and Mathematics, as the instrument for national development. The basis of this advancement is rooted in technology which Mathematics is the bedrock. In other words, Mathematics is the precursor and an indispensable facilitator in modern societal development. Therefore, every effort is being made for effective Mathematics education, especially at the secondary school level, due to the unequivocal role it plays in the nation's scientific and technological development as well as responses to societal needs and demands. (Okeke, 2015).

In the words of Ezeamenyi (2001), Mathematics is the key to a productive and fulfilling life. That is, Mathematics serves as a key to performing many diversified functions in life. Owing to this, Odogwu and Lawal (2015) observed that teaching of Mathematics, especially with various methods, is a highly strategic endeavour requiring expertise and experience on the job. Hence, the professional development of the Mathematics teachers will be of good effect on the students' learning efficiency which results in the desired performance of students.

According to Azuka (2008), despite the indispensability of Mathematics in the development of humanity, it has witnessed a persistent failure in both internal and external examinations. This failure is attributed to perceived difficulties in Mathematics by students and poor teaching method by Mathematics teachers. Successive governments and education related agencies both in public and private sectors have made efforts to reduce the poor performance in this all-important subject. Such organs give incentives to excelling students with high grades in

the subject and their teachers with the aim to improve the teaching and learning process of Mathematics, (Attah and Domyil, 2015). Despite these efforts, learners' achievement is still taking a downward trend. As a result of this persistent downward trend in students' achievement, researchers have tried to proffer solutions for this. Most of the researchers (Adeniji, 2014, Farayola, 2014, Azuka, 2012) have suggested making Mathematics less esoteric, learner-friendly, students'-oriented, practical oriented and above all recreational in nature.

Many viewed Mathematics as an everyday activity and should be taught as such. This is why various methods, especially recreational/play-way method, is advocated for. Worthy of note is that all human endeavours revolve around Mathematics even though many people are ignorant of it. Recreation, which is a pivotal source of vigour and vitality for man is chiefly dominated by mathematical activities. That is, people practice recreational Mathematics in an informal and uncommon ways.

Familiarity, they say, breeds interest. That is, students can learn better and effectively what they have interest in and what they find playful and fun. Teaching and learning of Mathematics can be enhanced through play way methods; with the use of games, puzzles, discovery, interaction and manipulation of objects. According to Michael and Iyekekpolor (2013), game has been reported to be one of the major ways of making the study of Mathematics interesting thereby reducing learners' phobia for the subject. Commenting on this phobia student have for Mathematics, Nworgu (1990) in Obodo (1997) articulated the fact that the inherent notion held by many Africans that Mathematics is a very difficult subject which is capable of making one *mad* is at the centre of the phobia which students exhibit for Mathematics and which has claimed many *casualties* over the years.

This situation is worrisome and has adversely hampered the learning of Mathematics. It has also left more to doubt about the efficacy of the conventional methods of teaching and learning

of Mathematics in secondary schools. Since play is the birth right of every child, according to Anaeche (2007), recreational Mathematics has been suggested as a more enhancing way and effective method of teaching and learning Mathematics.

Recreational Mathematics

Recreational mathematics is a term for Mathematics carried out for recreation (entertainment) rather than as a strictly research and application-based professional activity, although it is not necessarily limited to being an endeavour for amateurs. It often involves mathematical puzzles and games. Many topics in this field require no knowledge of advanced Mathematics, and recreational mathematics often appeals to children and untrained adults, inspiring their further study of the subject.

Mathematics teaching and learning can greatly be enhanced if teachers and students begin to view Mathematics as a recreational activity devoid of esoteric mathematical faculties. When students perceive Mathematics as what they do every day on the playground when they are playing ludo, chess, card game, geoboard, etc. then their learning attitude will begin to change and that will be shown in their performance in both external and internal examinations, and in application in other areas of life.

As stated above, recreational Mathematics does not necessarily demand a lot of Mathematical ingenuity and/or advanced knowledge of Mathematics. This gives all categories of Mathematics teachers a level playground to utilize this effective and enhancing method of teaching Mathematics. What the teachers need to do is to recognize student's prior knowledge and life experience or exposure and see what they (previous knowledge) can contribute to new learning in the classroom. That is, knowing what the students are used to, the type of play they do, their immediate environment and how these can be explained mathematically for them to appreciate that Mathematics is not only real on paper but also in their daily activities within their conferment.

As can be seen, recreational Mathematics is less demanding on the teachers, as they do not necessarily need to be professor of Mathematics before they can use it in enhancing teaching and learning of Mathematics. It makes teaching and learning process a stress-free exercise as it is full of entertainment and fun. This entertainment is usually seen in teaching and learning of Mathematics with the use of Mathematics games and puzzles.

Mathematics games and puzzles

Mathematical games are multiplayer games whose rules, strategies, and outcomes can be studied and explained using Mathematics. The players of the game may not need to use explicit Mathematics in order to play mathematical games. For example, ludo which is an everyday game for students is a mathematical game, which is used in teaching experimental probability. Stressing the importance of mathematical games, Ezeamenyi (1996) recommended that teachers be encouraged to introduce simulation game method in teaching as an innovation that would arouse the interest of students.

Mathematical games can be of advantage to both teachers and students. Using mathematical games as an aspect of recreational Mathematics to enhance and facilitate teaching and learning of Mathematics has been advocated for as an avenue of making teaching and learning of Mathematics a recreational activity. Blum and Yocum (1996) supported instructional game-playing in the classroom because it provided exciting and motivational strategies for students to practice skills already learned. Experience had shown that self-learning and subsequent success therein, is a comic relief for the students who see Mathematics as a difficult task. This is in fact making Mathematics recreational and less cumbersome.

Mathematical puzzles on the contrary require Mathematics in order to solve them. They have specific rules, as do multiplayer games, but mathematical puzzles don't usually involve competition between two or more players. Instead, in order to solve such a puzzle, the solver must

find a solution that satisfies the given conditions. The underlying principle here is that it encourages self-learning which builds confidence on the students and consequently enhances their learning of Mathematics.

Obodo (1997) suggested the following games as very important in the teaching and learning of Mathematics as recreational Mathematics.

Geoboard Game for identifying and differentiating polygons

Class: JSS 1, 2 or 3

Number of players: 2 or more

Materials: Geoboard, rubber bands, paper, pencil.

Objective: To identify and differentiate between various types of polygons.

Procedure

Player A uses a rubber band and forms, say, a scalene triangle. He scores 1 point. Player B identifies the shape formed by player A. He scores 1 point. Player B describes the properties of the scalene triangle. He scores 1 point for each correct property. If player B omits one or more properties, player A gives the properties and scores a bonus point for each property.

New player B forms, say, an isosceles triangle. He scores 1 point. Player A identifies it (1 point) and describes the properties of the isosceles triangle (1 point for each property). Bonus points are similarly scored by B if necessary. They continue with the game for other shapes, for instance, equilateral triangle, quadrilaterals (rectangle, square, parallelogram, trapezium, rhombus, kite, etc), other regular polygons (pentagon, hexagon, heptagon, octagon, nonagon, decagon). If one has formed a shape, the other is not allowed to repeat the formation of that shape. The player who has the highest number of poi

Geoboard Game for describing and locating coordinate points

Class: JSS 2 or 3 or high classes.

Number of players: 2 or more

Materials: Geoboard, rubber bands, pencil, paper.

Objective: To represent and locate coordinate points.

Procedure:

Player A indicates the X- and Y- axes on the goebord using two rubber bands – one for x-axis and one for y-axis. He points at any pin or nail on the geoboard and asks player B to describe the point, say, (1, 2) and then write it down on paper. Player B points at another pin and asks player A to describe the points, say, (3, -2). Each scores 1 point. The game continues this way until each describes 20 points. If player B fails to describe the point correctly, player A describes the point and gets a bonus mark (1 mark)

In the second part of this game, player A mentions a point, say (0, -3) and asks player B to show the position of the point on the geoboard. Then player B mentions another point, say,

(-2, 6) while player A locates the position of the point on the geoboard. Each scores 1 point. The game continues this way until each locates 10 or 20 points each as desired. Bonus points are scored accordingly. The player who gets higher number of points wins the game.

Card game for ordering fractions

Class: JSS 1, 2 or 3

Number of players: 2 or more.

Materials: 60 cards which contain positive fractions only with denominator less than or equal to 12. The value of each fraction must be less than 1. In other words, the fractions must be proper fractions. Paper and pencil.

Objective: To arrange fraction either in increasing or decreasing order of magnitude.

Procedure: The 60 cards are shuffled properly. Each of the players, say 4, is dealt 5 cards. The players are required to arrange the fractions in decreasing order. A player wins if he or she is the first to complete the arrangement correctly. This game can be played for 5 or more times. The player with highest number of win out of 5 (or more) is the overall winner. If there exist a tie, any of them who wins the next game becomes the overall winner.

Consider the following 5 cards dealt to a player.

$\frac{2}{5}$ $\frac{4}{7}$ $\frac{3}{11}$ $\frac{1}{3}$ $\frac{5}{9}$

To arrange them in descending order, the LCM of the denominators are found.

LCM = 5 x 7 x 11 x 3 x 9

Using the LCM, the fractions are now obtained as follows respectively.

$$\frac{2X7X11X3X9;\ 4X5X11X3X9;\ 3X5X7X1X5;\ 1X5X7X11X9;\ \ 5X5X7X11X3}{5X7X11X3X9}$$

$$= \frac{4158;\ 5940;\ 3465;\ 5775}{5X7X11X3X9}$$

The arrangement in the descending order is

$\frac{3}{11}$ $\frac{1}{3}$ $\frac{2}{5}$ $\frac{5}{9}$ $\frac{4}{7}$

For easy checking, then 60 cards are numbered from 1 to 60 on the reserve side. For example, the above 5 cards already in decreasing order, are numbered as below:

42	3	10	50	6

Conclusion

Mathematics is a sure and compulsory subject in the secondary school curriculum. Therefore, all effort should be explored in making its teaching and learning friendly. In view of this, the paper has x-rayed the inherent and indispensable roles of Mathematics in the life of a student and in the life of a nation like Nigeria. It is the bedrock of technological advancement which every country craves for now. This paper had also gone through to suggest practical way of making Mathematics teaching and learning a fun and entertaining adventure. This is why the use of recreational Mathematics in enhancing secondary school Mathematics became the focal point of this paper. Recreational Mathematics of course is a term for Mathematics carried out for recreation (entertainment) rather than as a strictly research and application-based professional activity, although it is not necessarily limited to being an endeavour for amateurs. It often involves mathematical puzzles and games.

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