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Developing Perfect Square Root Board Games for Teaching Square Root in Secondary Schools and Colleges

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Abstract

Mathematics has continued to play a significant role in the national development of any country. To achieve the modern technology in teaching. Mathematics by the year 2025, emphasis should be laid on the use of teaching aids. Teaching aids help to make teaching effective and learning permanent to learners. The purpose of this paper is to develop perfect square root board games for teaching square root in secondary schools. This serves as teaching aids and square root is an aspect of mathematics in junior secondary schools. The paper introduced square root of numbers as an aspect of mathematics and its importance to other aspect of mathematics was discussed.

The statement of problem has reported poor achievement of students in mathematics. the game is being introduced to help in the improvement of the standard of mathematics understanding. The method of playing the game was also introduced. The game is made up of wooden board glass and chart including roots of numbers. The game can also be presented in electronic form. The use of square root board game will enhance the teaching and learning of mathematics, which will go a long way in encouraging students that are not interested in learning mathematics to develop an interest. In conclusion it was recommended that government should encourage the use of game in the teaching and learning of mathematics in all secondary schools. Also mathematics teachers should be trained and retrained on the use of games to teach different concepts in mathematics. This should be done through seminal, workshops and conferences.

1.1 Introduction

The study of numbers is vital to intellectual development as well as the development of innovative ideas and choice of career. Mathematics is a vital tool for day to day activities in such fields as engineering, piloting, Agriculture, banking, medicine e.t.c (Abudulahi, 2008). Infact, the development of a country lies in the technological know how of such a country and there is no science and technology without Mathematics. Other field of study in one way or the other are dependent on Mathematics for solving their problems through conducting research, stating hypothesis and making findings. With Mathematics one Can easily develop the ability to think critically and logically. It also helps in the development of innovative ideas. Johnson and Rising (2012) define Mathematicsas a creation of human mind, concerned primarily with ideas, processes and reasoning. The concept pictured Mathematics as a way of thinking, organizing a logical proof, determining whether or not an idea is true or at least whether it is probably true. Nelist and Nichel(2016) defined Mathematics as a set of precise and logical languages which not only lead to interesting activities in their own right but can also be applied to everyday life and other areas, Ogunmoyela (2018) define

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Mathematics as the bedrock of all scientific and technological breakthrough and advancement. The author stated further that Mathematics is primary concerned with the method of discovering. This implied that the society is much more comfortable and related when emphasis is placed on applications of Mathematical concepts from the foregoing, it can be Said that Mathematics is a dynamic, exploding field of knowledge which has much to offer in science, technology, art and everyday living. It is well known fact that the success of an educational programme depends partly on the quality of those who teach it many research works have been carried out to find how teachers variables enhance students achievement in Mathematics, such variables include qualification of teachers, Obioma(1992), length of teachers experience and gender effect, Salman (2015) and method of teaching Alia (1997). Many research studies have revealed that student's achievement in Mathematics has been deteriorating, WACE annual reports (1996 -1998) Harbor-Peter (1992) and Lash (2013). The poor achievement of students in Mathematics at various levels of education has been variously expressed. In an attempt to provide solutions to this persistent poor achievement in Mathematics among students, researchers discovered various teaching approaches like team teaching approach by Umoko and Jinin (2011), Ethno Mathematics teaching approach by Veurumeh (2006). Discovery method by Ajeivole (1997). Ethno- Mathematical teaching approach like the use of traditional method of teaching Mathematics which inculcates play method of learning Mathematics. This is also called game method which makes the student to participate actively with kneen interest thereby reducing boredom, stress and tension. It enables the learner play with fun, hand and mind on activities are being encouraged which makes learning interesting and enjoyable. It also helps the learner to develop lasting trust and confidences in self and his instructor. It also helps the learner and the teacher. it helps the learner to richly reflect in his thinking and reasoning faculty. It fosters meaningful discourse that results in active learning and a higher ability to study Mathematics at all times. It is among this background that this paper want to develop perfect square root board games for teaching square roots in secondary schools and colleges.

1.2 Statement of the problem

Over the years, Mathematics has been dreaded by many students as a result of impression created in their minds that the subject is difficult. The situation has been further compounded by the quality of instruction offered by Mathematics teachers. The trend of students achievement, according to WAEC report of 2010 review abysmal achievement. This has greatly affected enrdolment into the science related courses in tertiary institutions in Nigeria and Unified tertiary matriculation examination board (UTME) (2009). Furthermore, Amoo(2000) and Adebayo(2011) also observed that in Nigeria, evidence from research findings shows that student's achievement in Mathematics is characterized by low achievement. The West African Examination Council (WAEC 2010) has consistently reported poor achievement in Mathematics especially in Algebra. The chief examiner in Delta State (2009) reported on this poor achievement in Mathematics. Mathematics games has been developed by Mathematics educators like Agwaga, Odili 2006. However, the impact of game as a mode of learning, teaching and assessment in Mathematics instruction has continued to improve the standard of Mathematics understanding of students in developed countries such as the United States of America and Europe Ndili(2009). According to Ndili (2009), the relevance of game to Mathematics education lead credence to its inclusion in the curriculum of these advanced countries. It has been experimentally confirmed that the use of game in Mathematics in the area of Algebra has resulted in improved achievement of students in these countries. Incidentally, in Nigeria, especially in Delta State, little or nothing has been done to integrate this game in Mathematics. Instruction. The present study therefore sought to develop perfect square root board game for teaching square root in Mathematics instruction.

1.3 Goals and Objectives

The purpose of this project is to develop perfect square root board games for teaching square root in Mathematics instruction, specifically, the project is designed to:i. Identify what square root of number are and easy ways to get square root of any number.ii. Determine the method of solving square root of numbers through games.iii. Ascertain the practical formulation of the square root game.iv. Inquire on how to play the square root game.v. Examine what can be done with the square root game

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2.0 Review of Literature

Not much attempt has been geared toward exploring Mathematical games in complementing Mathematics instruction. This gap is even amplified by the lack of attention paid to Mathematical games by most secondary Mathematical text materials in Nigeria. Even, there are doubts as to whether many of the secondary teacher education programmes in Mathematics pay enough attention to enabling prospective teachers of the subjects acquire necessary competencies in designing and using Mathematical games. Games in general serve the purpose of recreation and often generate excitement and spirit of competition, Games serve as reinforcement to both winners (to strive to maintain their lead) and looser(to strive to overcome their defeat). Attempt has been made to categorize instructional activities intodevelopmental and practical activities. Some activities especially introductory ones are to help pupils to understand a concept, these are developmental activities. Other activities are designed, to help pupils to remember a concept or skill; these are practical activities. Instructional materials should be available for development and practice. Presumably, changing methods instructional patterns and use of class time imply changes in utilization of classroom. UnderHill(2017) asserts that research has supported the use of 50 to 75 percent of class time for developmental activities and 25 to 50 percent for practice. However, practice is often a boring experience. Since games release tension, clear boredom and foster an environment where the learner can grow in his or her skills and acquire further knowledge. We need games like activities, which contain camouflaged practice. Obioma (1983) asserts that game and Mathematics learning are related in the sense that each has rules, involving experiences, drill and practical applications. The planning of appropriate games for learning Mathematics actually depends on both the learners and teachers ingenuity. Mathematics games though useful, can be abused in the classroom. Especially with the younger students, disorder can be created in the class when the teacher uses the game inappropriately. Here are some guides to the proper utilization of games in the classroom:

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i. Select a game to match the needs of the class, the Mathematical topic in question, the interest profiles of the teacher all must be taken into account while selecting games.

ii. Use the game at the appropriate time. The teacher must decide when to introduce the game so as to achieve its result in relation to the concept being taught and objectives. For instance, does the teacher want to facilitate set induction, reinforce an old idea, and remedy the observed deficiencies;

iii. Arrange the game situation to allow full participation by all members of your class in everyday play;

iv. Plan and organize the game carefully so that the informality and excitement of the setting do not defeat its purposes;

v. Emphasize the responsibility of learning something from the game. It is essential that teachers should draw out the relationship between game and actual learning process. Ohuche(1996) lists ludo, draughts or checkers-azigo or Okwe (igbo) or ayo (Yoruba), number games and puzzles and monopoly as games that are required in a Mathematics laboratory. Some games available are as follows

.i. Card games for evaluating Algebraic expression.

ii. Card games for simple linear equation

iii. Card games for fractions.

Galadima & Okogbenin studied on the effect of Mathematical games on the academic performance and attitudes of students towards Mathematics in sokoto state where a total of 664 senior secondary two students formed the sample of the study. Six secondary schools were used, in each of the sample school one class was used for experimental group while the other served as control group. They found out that students taught using Mathematical games method performed better in Mathematics than their counterparts taught using the traditional method.

3.0 Methodology

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The design and the development of square root board game will be done in the following steps:

3.1 How to develop the square root board game

The game can be made manual or by using electric gadget. The game is made up of wooden board, glass and chart which include square root of numbers. The skeletal diagram of the game is shown below. Other things that can be used when playing the game are dices and tiles.

3.2 Method of playing the game

i. The game starts with the use of two dices

ii. Two or more persons can start to play the game

iii. The person that will start the game must have six out of the two dices to start the game.

iv. Two or more different colours of tiles can be used to play it.

v. Square roots of number board is valuable which has different numbers

vi. The first person to get six play by counting from the left towards the right.

vii. Agreement has to be made with the players to know if the tiles for the value board will be worn in a diagonal, vertical or horizontal arrangement before a winner is declared.

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NUMBER BOARD

$\sqrt{1}$	$\sqrt{4}$	$\sqrt{9}$	$\sqrt{16}$	$\sqrt{25}$	$\sqrt{36}$	$\sqrt{49}$	$\sqrt{64}$	$\sqrt{81}$	$\sqrt{100}$
$\sqrt{121}$	$\sqrt{144}$	$\sqrt{169}$	$\sqrt{196}$	$\sqrt{225}$	$\sqrt{256}$	$\sqrt{289}$	$\sqrt{324}$	$\sqrt{361}$	$\sqrt{400}$
$\sqrt{441}$	$\sqrt{484}$	$\sqrt{529}$	$\sqrt{576}$	$\sqrt{625}$	$\sqrt{675}$	$\sqrt{729}$	$\sqrt{784}$	$\sqrt{841}$	$\sqrt{900}$
$\sqrt{961}$	$\sqrt{1024}$	$\sqrt{1069}$	$\sqrt{1156}$	$\sqrt{225}$	$\sqrt{1296}$	$\sqrt{1369}$	$\sqrt{1444}$	$\sqrt{1521}$	$\sqrt{1600}$
$\sqrt{1681}$	$\sqrt{1764}$	$\sqrt{1649}$	$\sqrt{1936}$	$\sqrt{2025}$	$\sqrt{2116}$	$\sqrt{2209}$	$\sqrt{2304}$	$\sqrt{2401}$	$\sqrt{2500}$
$\sqrt{2601}$	$\sqrt{2704}$	$\sqrt{2809}$	$\sqrt{2916}$	$\sqrt{3025}$	$\sqrt{3136}$	$\sqrt{3249}$	$\sqrt{3364}$	$\sqrt{3481}$	$\sqrt{3600}$
$\sqrt{3721}$	$\sqrt{3844}$	$\sqrt{3969}$	$\sqrt{4096}$	$\sqrt{4225}$	$\sqrt{4356}$	$\sqrt{4439}$	$\sqrt{4624}$	$\sqrt{4761}$	$\sqrt{4900}$
$\sqrt{5041}$	$\sqrt{5184}$	$\sqrt{5329}$	$\sqrt{5476}$	$\sqrt{5625}$	$\sqrt{5776}$	$\sqrt{5929}$	$\sqrt{6084}$	$\sqrt{6241}$	$\sqrt{6400}$
$\sqrt{6561}$	$\sqrt{6724}$	$\sqrt{6889}$	$\sqrt{7056}$	$\sqrt{7225}$	$\sqrt{7396}$	$\sqrt{7569}$	$\sqrt{7744}$	$\sqrt{7921}$	$\sqrt{8100}$
$\sqrt{8261}$	$\sqrt{8464}$	$\sqrt{8643}$	$\sqrt{8836}$	$\sqrt{9025}$	$\sqrt{9216}$	$\sqrt{9409}$	$\sqrt{9604}$	$\sqrt{9801}$	$\sqrt{10000}$

VALUE BOARD

2	5	89	100	8	81	3	7	99	6
80	87	1	27	4	29	83	39	12	82
95	14	32	93	20	41	23	85	25	31
35	51	43	55	96	18	36	38	44	16
22	97	11	76	73	34	57	94	47	50
90	45	74	60	84	77	53	69	75	49
48	72	30	68	56	92	70	61	88	40
17	62	78	19	52	21	63	13	98	59
86	28	54	66	9	64	33	58	46	71
10	42	65	91	67	24	37	79	26	15

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Programme / Time table

Activity	Description	Time
1	Design of the project	2 weeks
2	Procurement of items /Materials for the project	3 weeks
3	Development of square root board	4 weeks
4	Development of graphic work	4 weeks
5	Production of report and documentation	2 weeks
	Total duration	15 weeks

Budget Proposal / Justification of Expenditure

S/n	Material	Unit price	Quantity	Total
1	Square root board with glass	250,000	1	350,000
2	Artist design of numbers	750	200	150,000
3	Value board with glass	250,000	1	250,000
4	Dice / Cap	1000		1000
5	Tiles of different colours	4000		4000
6	Production of report	20,000		20,000
7	Tables/ Chairs	10,000	6	60,000
8	Miscellaneous	65,000		65,000
	Total			900,000

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Conclusion

This paper introduces the practical way of teaching square root in such a way that when the students are playing the game they will at the same time be able to learn how to get square root of numbers. The students are involved mainly in the teaching/learning situation and the playing of the game is more effective and makes it a better and fast understanding of the concept being introduced (that is square root of numbers)

Recommendation

The following recommendations are made due to the result of the study:

1. The government should encourage the use of game in the teaching and learning of mathematics in all secondary schools. This will enhance teaching and learning of mathematics

2. The use of games in schools will motivate students who lack interest in mathematics to have interest in learning.

3. Mathematics teachers should be trained and retrained on the use of games to teach different concept in mathematics . This should be done through seminal, workshop and conferences.

4. Curriculum planners should inculcate game method into the curriculum of the students and ensure that it is being implemented for effective teaching and learning of mathematics.

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