Strategies for Promoting Primary School Pupils' Understanding of Mathematical Concepts in Onitsha South Local Government Area, Anambra State.

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Abstract

This study investigated the strategies for promoting primary school pupils' understanding of mathematical concepts in Onitsha south local government Area, Anambra state. A descriptive survey design was adopted. Two research questions guided the study. The population consists of 1,105 primary school teachers with a sample of 100 teachers drawn using simple random sampling technique. A 20 item Questionnaire titled "Strategies for Promoting Primary School Pupils' Understanding of Mathematical Concepts Questionnaire (SPPSPUMCQ) was used to collect the data. The instrument was validated by 3 research experts. The data collected were analyzed using mean. A gross reliability coefficient of 0.75 was obtained using Cronbach-Alpha method. Result showed that lack of adequate textbooks, instructional materials and parental support are the factors that hinder pupils' understanding of mathematical concepts. The study therefore recommended among others that Mathematics should be taught by specialized teachers, Parents should endeavour to give full support to pupils' mathematics learning, adequate textbooks and instructional materials should be provided for the pupils' teaching and learning of mathematics.

Keywords: Strategies, mathematics, mathematical concepts, primary education

Introduction

Mathematics is an everyday experience for both young and old. Majority of man's daily activities revolves around mathematics. According to National research council (2001), mathematics is one of humanity's great achievements. By enhancing the capabilities of the human mind, mathematics has facilitated the development of science, technology, engineering, business, and government. Naturally, mathematics nurtures the power of reasoning, creativity, abstract or spatial thinking, problem-solving ability, critical thinking, and effective communication skills. For people to participate fully in society, they must know basic mathematics. Citizens who cannot reason mathematically, are cut off from whole realms of human endeavour. Innumeracy deprives them not only of opportunity but also of competence in everyday tasks (National Research Council 2001). Mathematics plays a major role in the development of a child and also helps children make sense of the world around them (Louis 2018). Mathematics is an important aspect of learning for primary school children; because it provides vital life skills which will help children problem-solve, measure and develop their own spatial awareness (Louis 2018). The science of mathematics

depends on the mental ability. It is the means to develop the thinking power and reasoning intelligence, which sharpens the mind and makes it creative. The development of human beings and their culture depend on the development of mathematics. This is why it is known as the base of human civilization (Dharmendra 2017).

Mathematics in its simplest definition can be defined as the study of numbers, shapes and patterns. The Oxford advanced learner's dictionary (6^{th} edition) defined mathematics as the abstract science of number, quantity, and space either as abstract concept (pure mathematics) or as applied to other disciplines such as physics and engineering (applied mathematics). Dharmendra (2017), defined mathematics as the study of assumptions, its properties, and applications. Mathematics can also be defined as the study of numbers, shapes, and space using reason and usually a special system of symbols and rules for organizing them (Cambridge dictionary). Mathematics is a branch of science, which deals with numbers and their operations. It involves calculation, computation, solving of problems. Roohi (n.d), defined mathematics as the study of quantity, structure, space, and change; it has historically developed through the use of abstraction and logical reasoning from counting, calculation, measurement, and the study of shapes and motions of physical objects.

Mathematics as a subject in the primary level of education is a very vital subject that has great potentials in aiding to the children's growth and development. As a result of the nature of its importance in the growth and development of young children; mathematics is deemed as a core subject in the primary education curriculum. The primary grades are often considered the most important years of a child's school career; because it is the foundation stage for all other further level of education. The inspiring and effective nature of mathematics has made a great emphasis to be placed on it as one of the major content knowledge which the primary school children will use as the foundation for the rest of their education (Lawrence 2018). An important aspect of teaching and learning is that the learner's age, level of development and level of comprehension, has to be given a due and appropriate consideration; in respect to this, an appropriate understanding of the primary school children has to be effectively taken into consideration.

Primary school children are children under the tutelage of receiving primary education. Primary education is typically the first stage of formal education, coming after pre-school and before secondary school. Primary education takes place in primary school, elementary school or first and middle school depending on the location. Etor, Mbon, and Ekanem (2013), opined that

primary education is universally accepted as the foundation laying level of education in all nations of the world. It provides the mini-structural framework on which the quality of other levels of education is anchored. The Federal Republic of Nigeria (2004), defined primary education as the education given to children aged 6 to 11 plus in primary schools; and that the primary level is the key to the success or failure of the whole system since the rest of the education system is built upon it. Also the Federal Republic of Nigeria (2004), listed the goals of primary education to be:

a. Inculcate permanent literacy and numeracy and ability to communicate effectively.
b. Lay a sound basis for scientific and effective thinking.
c. Give citizenship education as a basis for effective participation in and contribution to the life of the society.
d. Mould the character and develop sound attitude and morals in the child.
e. Develop in the child the ability to adapt to the child's changing environment.
f. Give the child opportunities for developing manipulative skills that will enable the child to function effectively in the society within the limits of the child's capacity.
g. Provide the child with the basic tools for further educational advancement, including preparation for trades and crafts of the locality.

Furthermore, Anero (2014) emphasized that primary education is commonly observed to be an education given to children within the late childhood. Primary education is best understood to cover education one receives before entering secondary school or reaching early adolescents. Primary school children are classified to be in the stage of concrete operational stage in respect to Jean Piaget's theory of cognitive development. At this time, elementary age and pre-adolescent children ages 6 to 11; show logical, concrete reasoning. The children's thinking become less focused on themselves, they are increasingly aware of external events. They begin to realize that their own thoughts and feelings are unique and may not be shared by others or may not even be part of reality. Most children of this stage can't think abstractly or hypothetically. Federal Republic of Nigeria in Ncheke (2016), also noted that teaching at this level shall be by practical, exploratory and experimental methods. Boskic (2011), sees children within this age-range 6-12 to be in their middle childhood. Boskic (2011), further defined them to continually grow. Cognitive development becomes increasingly complex as the children continue to learn how to make sense of the world around them. This is also a busy time for picking up academic skills. Children in this stage are learning how to read, write, spell and perform simple mathematical operations. Boskic

(2011) also explained that children at this age are very curious and eager to learn. It is important to foster this curiosity and eagerness to learn by answering their questions and giving them fun and fulfilling activities to engage in. they are very concrete in the way they view the world. They need to experience things in order to understand them. It is therefore extremely important that they be provided with a lot of opportunities to play and experiment with everyday situations and materials. Sufficient understanding of the primary school children's development and growth will serve as a guide to the teachers and care givers in their teaching and learning of mathematics to primary school pupils. It will also help them to comprehend the complexities involved in mathematical learning and understanding of mathematical concepts.

Mathematical learning is associated with the development of mathematical understanding. Mathematical understanding entails understanding of mathematical concepts (Taylor 2013). According to view of Simon (2018), promoting mathematical understanding is one of the most difficult challenges in teaching. Promoting as a word itself means to raise or to increase from a lower position to a higher position. Hence promoting in this context simply means raising or increasing the understanding of mathematical concepts in primary school pupils. Effective understanding of mathematical concepts by primary school pupils will be a great boost in their intellectual prowess and a great plus to the way they reason and handle the challenging problems they encounter in their daily living. Concepts are defined as abstract ideas or general notions that occur in the mind, in speech, or in thought. They are understood to be fundamental building blocks of thoughts and beliefs. Concepts play an important role in all aspects of cognition. Also concepts can be viewed as principles or ideas; they can also be seen as ideas of how something is, or how something should be done. Concepts can also be taken to mean abstract or general ideas inferred or derived from specific instances. According to Stamford encyclopedia of philosophy, concepts are the building blocks of thoughts. Consequently, they are crucial to such psychological process as categorization, inference, memory learning and decision making.

Bringing it together, mathematical concepts simply means the ideas or the notions of how mathematical problems are solved. Simon (2017), defined mathematical concepts to be the knowledge of the mathematical necessity of a particular mathematical relationship. Simon (2018), went further to buttress this saying this means knowledge that given what we have learned previously, a particular relationship must exist. This can also be seen as the knowledge of the logical necessity of a mathematical relationship. Mathematical concepts are the ideas that serve as

a guide to a better understanding of mathematics. Teaching children mathematics cannot be effective without helping them develop a proper comprehension balance of mathematical concepts. It is their understanding of mathematical concepts that will lay the foundation blocks of learning and understanding mathematics. Helping children to understand mathematical concepts can take variety of forms. These variety of forms can otherwise be called strategies.

Strategies in its simplest meaning can be defined as a plan of action designed to achieved a long term or overall aim. Strategy can be intended or can emerge as a pattern of activity. The Longman dictionary defined strategy as a planned series of action for achieving something. Generally, strategy can be seen as a skillful planning with the aim of achieving a laid down goal or objective. Thinking about the necessary strategies that will promote primary school pupils' understanding of mathematical concepts; teachers and caregivers of primary school pupils should bear in mind that children begin learning mathematics well before they enter elementary school. Starting from infancy and continuing throughout the pre-school period, they develop a base of skills concepts and misconceptions (National Research Council 2001). Also children are interested in mathematics well before they start school. They notice basic shapes, construct and extend simple patterns and learn to count. Hence, it is very necessary to build on children's natural interest in math to make their understanding of mathematical concepts much easier (National Center for Educational Evaluation and Regional Assistance, 2013). Teachers and caregivers of primary school pupils need not neglect the factors that hinders primary school pupils' understanding of mathematical concepts. This is very important because the very first step in finding solution to a lasting problem is being able to identify the cause of the problem. Once they can be able to identify these factors, then it will be much easier for them in finding strategies for promoting the pupils' understanding of mathematical concepts.

The underlying factor in promoting primary school pupils' understanding of mathematical concepts is for them to be competent in handling everyday activities that involves mathematics. According to Mukunthan (n.d), mathematics competencies are important to understand the information which gets from the notices, newspapers, radio, television, internet. People use the mathematical skills and knowledge several times in their day to day life. therefore, understanding the mathematical concepts is important. Counting, measuring, problem-solving, logical thinking, and decision making are some of the basic mathematics skill used in day to day life. Mukunthan (n.d), outlined the primary mathematical concepts in the primary level of education as follows:

a) Sorting and inclusion, b) Relation one-to-one, c) Neighbourhood and ordering, d) Shape and symmetry, e) Money, f) Length and perimeter, g)Weight, h)Volume and capacity, i)Area, j)Time, k)Graphs, l)Direction and scale drawing, m)Number counting and patterns, n)Number understanding, o)Number comparison, p)Number ordinal, q)Number addition, r)Subtraction, s)Multiplication, t)Division, u)Problem solving, v)Place value, w)Unitary method, x)Roman numerals, y)General fractions, z)Decimal fractions.

However, lack of mathematical knowledge and skills in primary school pupils results in their great aversion for the subject mathematics. This will result to the development of phobia and anxiety towards the subject mathematics. Okafor, Ikpeazu and Ojaga (2016), consequently affirmed that the inability of some pupils to successfully comprehend and apply mathematical principles in solving mathematical task during teaching and learning makes them feel discouraged, become fearful of the subject and develop mathematics anxiety. When this arises, it negatively impairs the mathematics achievement of children as they engage in mathematical task. When children at their tender age experience mathematics phobia coupled with negative reinforcement from and within their immediate environment, they tend to avoid learning mathematics, express negative self-verbalization and attitude towards the subject. They also lose confidence in their ability to comprehend the principles and concepts of the subject mathematics. Often times, they become unnecessarily agitated and over anxious whenever they are made to face mathematical task (Okoiye & Falaye cited in Okafor, Ikpeazu, & Ojaga 2016). Similarly, Oluwatayo, Anyikwa and Obidike (2020), observed that pupils still see mathematics as a difficult subject to be passed and as such run away from mathematics classes. They also confirmed that the performance of pupils in mathematics both in internal and external examination is not encouraging. All these challenges of pupils in tackling mathematics related problems still fall back to pupils' poor understanding of mathematical concepts.

There has been a great decline in primary school pupils' average performance in mathematics. Pupils that lack proper understanding of mathematical concepts end up disliking the subject mathematics, and consequently develop phobia and anxiety towards the subject mathematics. When corrective measures are not taken to put an end to it, the pupils will not find it funny when they get to the higher level of education. They might even end up becoming frustrated or even drop out from school, since mathematics is a core subject, they can't keep on running away from it forever. In respect to this, Okoiye and Falaye cited in Okafor, Ikpeazu and

Ojaga (2016), opined that mathematics anxious individuals, in their expressed state of helplessness, have been found to demonstrate pain and frustration in response to mathematical task. Pupils with mathematics phobia and mathematics anxiety also tend to perform below their intellectual capability because of the high level of stress and tension that characterizes mathematics anxiety. The goal here is to identify the factors that hinders primary school pupils' understanding of mathematical concepts; and also find out the strategies for promoting primary school pupils' understanding of mathematical concepts.

Statement of the problem

Primary school pupils are naturally curious with a great interest in carrying out mathematical related tasks and play. Children today are growing up in a world permeated by mathematics. The technologies used in homes, schools, and the workplace are all built on mathematical knowledge. Many educational opportunities and good jobs require high levels of mathematical expertise. Mathematical experience is a sure thing pupils encounter in their daily activities. There is a high increase in pupils' poor performance in mathematics activities and examination. The decline in pupils' natural interest in mathematical related tasks elevates at an angle beyond the horizontal level. Pupils' poor understanding of mathematical concepts and poor knowledge of mathematical skills have consequently resulted to their development of phobia and anxiety towards mathematics. In extreme cases where the pupils can't find help to guide them in understanding mathematical concepts; they result to running away from the subject, in worst case scenario where they can't run nor hide any longer from the subject mathematics, they end up becoming school dropout. Some will be affected with a great lot of mathematical challenges at the long run, when they move to the higher level of education. Majority will find it difficult to cope up in the larger society. Hence, there is a great need to revitalize pupils interest in and understanding of mathematical concepts. Children's natural interest and curiosity in mathematical related activity will serve as the foundation stone for getting them back on track in embracing the subject mathematics. It is against this backdrop that the authors found it necessary to carry out this research in identifying the factors that hinders primary school pupils' understanding of mathematical concepts; and also to find out the necessary strategies for promoting primary school pupils' understanding of mathematical concepts.

Research Questions

The following research questions were generated which guided the study.

1. What are the factors that hinder primary school pupils' understanding of mathematical concepts in Onitsha South Local Government Area?
2. What are the strategies necessary for promoting primary school pupils' understanding of mathematical concepts in Onitsha South Local Government Area?

Method

This study aims to determine the strategies for promoting primary school pupils' understanding of mathematical concepts in Onitsha South Local Government Area, Anambra State. Two research questions guided the study. The researchers adopted a descriptive survey design. The population of the study comprised of 1,105 primary school teachers in the 21 public primary schools in Onitsha South Local Government Area in Anambra state. Using the simple random sampling technique, 10 schools were selected out of the 21 primary schools in the study area. Using the simple random sampling, 10 teachers were drawn from each of the 10 primary schools selected giving a sample of 100 teachers used for the study. A 20 item questionnaire developed by the researchers titled "Strategies for Promoting Primary School Pupils' Understanding of Mathematical Concepts Questionnaire (SPPSPUMCQ) was used as the instrument for data collection. The instrument was validated by three experts. A gross reliability coefficient of 0.75 was obtained using the Cronbach Alpha method. Arithmetic Mean was used as the statistical tool for data analysis. A four-point rating scale of Strongly Agree (SA=4 points), Agree (A=3 points), Disagree (D=2 points), and Strongly Disagree (SD=1point) respectively were used. The mean score of 2.50 was used for decision making. Mean responses of 2.50 and above were agree, while any mean score below 2.50 were disagree.

Results

Research Question 1: What are the factors that hinder primary school pupils' understanding of mathematical concepts in Onitsha South Local Government Area?

Table 1: Respondents mean score on the factors that hinder primary school pupils from understanding mathematical concepts in Onitsha South Local Government Area.

S/N	factors that hinder primary school pupils' understanding of mathematical concepts	X	Decision
1	Pupils don't have adequate mathematics textbook	2.9	Agree
2	Practical instructional materials are not adequate for the pupils	3.5	Agree
3	Parents don't give the pupils full support in mathematical needs	3.1	Agree
4	Mathematics is not taught by specialized teachers	4.0	Agree
5	The class size of pupils is bigger than the standard teacher- pupil ratio	3.6	Agree
6	Pupils' gender contributes to their understanding of mathematical concepts	2.5	Agree
7	Mathematics teachers are not given proper incentives	2.8	Agree
8	Academic background of pupils' parents contributes to their understanding of mathematical concepts	2.6	Agree
9	Pupils come late to school when mathematics lesson is over	2.4	Disagree
10	Teachers don't vary their teaching methods while teaching pupils mathematics	2.4	Disagree
	Cluster Mean	**2.98**	**Agree**

Table 1 above shows that only items 9 and 10 scored below 2.50 and the rest of the items has mean scores above 2.50, which shows that apart from items 9 and 10; all the other items are factors that hinder primary school pupils' understanding of mathematical concepts.

Research Question 2: What are the strategies necessary for promoting primary school pupils' understanding of mathematical concepts in Onitsha South Local Government Area?

Table 2: Respondents mean score on the strategies necessary for promoting primary school pupils' understanding of mathematical concepts in Onitsha South Local Government Area.

S/N	Strategies necessary for promoting primary school pupils' understanding of mathematical concepts	X	Decision
11	Classroom environment is conducive to learning and promotes student engagement	2.8	Agree
12	Developing the classroom climate to focus on high expectation to mathematics	2.6	Agree
13	Utilization of games and constructive competition in teaching children mathematical concepts	2.7	Agree
14	Teaching children mathematics in the manner of simple to complex; and from known to the unknown	3.1	Agree
15	Making mathematics lesson concretized, flexible, and interactive	3.8	Agree
16	Sensitizing and involving parents in their pupils' mathematics learning	2.7	Agree
17	Provision of professional development opportunities to strengthen teachers' understanding of mathematics and basic numeracy	3.6	Agree
18	Utilizing questioning and feedback loops to monitor pupils' learning and understanding of mathematical concepts	2.9	Agree
19	Teaching pupils mnemonic devices to remember concepts or processes	3.5	Agree
20	Explicit problem - solving strategies and scaffolding should be utilized in teaching pupils mathematical concepts	3.2	Agree
	Cluster Mean	**3.09**	**Agree**

In table 2, item 11-20 has mean scores of 2.8, 2.6, 2.7, 3.1, 3.8, 2.7, 3.6, 2.9, 3.5, 3.2 respectively which indicates that all the items so listed are the strategies for promoting primary school pupils' understanding of mathematical concepts in Onitsha South Local Government Area.

Discussion

The findings from table 1 revealed that pupils don't have adequate mathematics textbook, practical instructional materials are not adequate for the pupils, parents don't give the pupils full support in mathematical needs, mathematics is not taught by specialized teachers, the class size of pupils is bigger than the standard teacher-pupil ratio, pupils' gender contributes go their understanding of mathematical concepts, mathematics teachers are not given proper incentives, and academic background of pupils' parents contributes to pupils' understanding of mathematical concepts. These are factors that hinder pupils' understanding of mathematical concepts. Anigbo (2016) found out that the large class size, and teacher factor (where teachers are not given due incentives and when mathematics is not by specialized teachers in mathematics) negatively afftects

pupils' understanding of mathematical concept. Also Yemi and Adeshina (2013) concurred with the findings that gender difference, (most girls feel weakened with the erroneous information that mathematics is difficult to understand. This belief affects some students negatively), poor parental support, lack of adequate textbooks and lack of instructional materials are injurious and obstructs pupils' effective understanding of mathematical concepts. Wamala et.al in Kiwanuka, Van Damme, Noortgate, Anumenden and Namusisi (2015) observed that the difference in the father and mother education levels explains the difference in each one's support for their children's achievement in mathematics. Also pupils whose parents are not educated find it hard to comprehend mathematical concepts when compared to their counterparts whose Parents are educated.

The findings from table 2 show that ensuring that the classroom environment is conducive to learning and promotes student engagement, developing the classroom climate to focus on high expectation to mathematics, utilization of games and constructive competition in teaching children mathematical concepts, teaching children mathematics in the manner of simple to complex; and from known to the unknown, making mathematics lesson concretized, flexible, and interactive, sensitizing and involving parents in their pupils' mathematics learning, provision of professional development opportunities to strengthen teachers' understanding of mathematics and basic numeracy, utilizing questioning and feedback loops to monitor pupils' learning and understanding of mathematical concepts, utilizing questioning and feedback loops to monitor pupils' learning and understanding of mathematical concepts, and explicit problem - solving strategies and scaffolding should be utilized in teaching pupils mathematical concepts are the necessary strategies for promoting primary school pupils' understanding of mathematical concepts. The national center for educational evaluation and assistance (2013), suggested that the effective strategies for promoting children's understanding of mathematical concepts include; using open-ended questions to prompt children to apply their math knowledge, teaching children in the manner of from concrete to abstract and from simple to complex, assess, record, and monitor each child's progress so that instructional goals and methods can be adjusted as needed. Chen and Weiland (2007) also affirmed that providing opportunities for concrete experiences, flexible instruction and scaffolding, promoting both pupils and parental collaboration are benefiting strategies for helping children to learn mathematics. Oluwatayo, Anyikwa and Obidike (2020) noted that utilization of

game-based learning strategy helps to remove the elements of difficulty in the course of teaching and learning primary school mathematics. Leone, Wilson and Mulcahy (2010) listed the following; teaching pupils mnemonic devices to remember concepts or processes, using explicit problem-solving strategy, using games and constructive competition to practice and review numeracy skills, promoting student engagement and a classroom environment conducive to learning and developing a classroom climate focused on high expectations for mathematics as strategies for improving pupils' understanding of mathematics instruction.

Recommendations

The following recommendations were made:

1. Mathematics should be taught by specialized teachers.
2. Parents should endeavour to give full support to pupils' mathematics learning.
3. Adequate textbooks and instructional materials should be provided for the pupils' teaching and learning of mathematics.
4. Mathematics lesson should be concretized, flexible, and interactive.
5. The classroom climate should be developed to focus on high expectation to mathematics.

Conclusion

The study established that mathematics is an important subject as mathematical tasks revolves around the daily activities of man. The 21st century being regarded as the age is daily unfolding with technological inventions that are mathematically inclined. However, the poor performance of pupils in mathematics is nothing to write home about. Due to this unsatisfactory achievement of pupils in mathematics, possible factors that hinder the pupils' understanding of mathematical concepts were identified, and the necessary strategies for promoting pupils' understanding of mathematical concepts were also listed for adoption.

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