

CHAPTER ONE

INTRODUCTION

Background to the study

The African society and for that matter the Ghanaian society used mathematical concepts before the advent of Western type of education around 1471. Mathematical concepts manifest in human activities hunting where the hunter has to estimate the distance of the animal before shooting. In cooking, where the cook has to calculate the quantity of the ingredients for very delicious meal. Children on the other hand use mathematical concepts when playing games. Concepts like counting, adding and subtracting among others, are already familiar with even the children long before the advent of the Western education which came with the structured concepts making them more meaningful and learnable as a formal enterprise.

According to “Collins Advance learners English Dictionary” mathematics is the study of numbers, quantities or shapes. Cambridge international dictionary (1996) also defines mathematics as the study of numbers, shapes and space using reasons and usually a special system of symbol and rules for organizing them. There are many topics in mathematics that employs manipulation of numbers at the different levels of education in Ghana. The need for the in-depth knowledge in those concepts at the basic level can’t be over stated.

The understand and interest in mathematical concept at the basic level goes a long way to boost the pupils understanding of mathematics. On the other hand, the pupils misunderstanding of these concepts in studying mathematics will demoralize them and dim their interest. The role

that mathematics plays in the progress of education in Ghana cannot be look down upon. It is a pre requisite for further studies as well as job opportunities. Scaring low grades, prevent potential candidates from further studies.

To be able to solve problems in topic such as numbers and numerals, addition, subtraction, multiplication and division are found in the junior high school mathematics syllabus. One requires an understanding of the place value concept to cope. Due to the significance of the subject at the basic level, the concept has to be well managed to make learning at higher level a pleasure. But most junior high school especially those in the B 7 Seven find it difficult to solve mathematics problems. Perhaps they were introduced to the concept without the use of teaching and learning materials or with inappropriate methods or material for their level.

The researcher in her teaching practice as part of the three year diploma in basic education programme discovered that some pupils in Sekyere R/C primary have difficulty in solving problems in addition and this could be traced to their inability to understand the concept of place value. It is against this background the researcher decided to under take this study to make mathematics more interesting and levelly to the pupils.

Statement of the problem

Over the years, efforts have been made by researchers in education to make teaching and learning of mathematics more of a fun than more activity. This has been seen in the organization of various seminars workshops and symposia for mathematics teachers. Nevertheless, teachers especially those in the junior high school felt reluctant in using the appropriate teaching and learning materials and strategies to develop mathematical concepts in

children. The researcher looks for more appropriate and easier ways of assisting pupils to solve problems on place value by the use of Abacus.

Purpose of the study

This study is carried out with the view of helping pupils learn to solve addition of four digit numbers correctly through the use of concrete materials notably abacus. The researcher attempts to help pupils improve upon problems solving in addition using the concept in addition using the concept of place value as far as mathematics is concerned.

Research questions

1. What teaching and learning materials are suitable for teaching addition of four (4) digits numbers
2. What are the problems in teaching addition using the concept of place value?
3. How effective is the abacus in helping the problem of addition of four (4) digit numbers.

Significance of the study

The outcome of the study will help to improve practice. The study will give a clear understanding of the concept to pupils which will enhance learning of the study will guide teacher to select suitable teaching and learning of the materials which are easy to use to help their pupils to understand the concept of addition of 7 digit numbers.

It is likely that the outcome will be put to practice by the teachers and other stakeholders in education. Also the outcome will help policy makers to strategies ways of policy formulation

to overcome the problem. The work will also add to the existing body of knowledge, since it could be used as literature review for future researchers.

Delimitation

The research is limited to basic 4 pupils of Akyem Sekyere Roman Catholic Primary. It is also limited to addition of four (4) digit numbers using abacus as the intervention tool

CHAPTER TWO

REVIEW OF RELATED LITERATURE

Introduction

This chapter deals with soliciting the opinion and views of others. In this chapter, the writer dwells on reviewing the work of authority's that are related to the topic being studied. The review is organized under the following sub headings.

- i. What mathematic is?
- ii. Importance of mathematics
- iii. Place value as a concept in mathematics
- iv. Problem of teaching mathematics
- v. Causes of pupils inability to understand the concept of place value
- vi. Effects of lack of knowledge of the concept of place value on pupils performance in mathematics
- vii. Importance of teaching and learning material sin the teaching of mathematics

What is mathematics?

Mathematics according to the Cambridge International Dictionary of English is the study of numbers, shapes and space using reasoning and usually a special system of symbols and rules for their organization. In addition, the Longman English Dictionary of contemporary usage defines mathematics as the science of numbers and of the structure and measurement of shapes.

Jackvani (1982) also gives the instrumentalist, the Fallibilist and Platonist views of what mathematics is. From the instrumentalist viewpoint, mathematics is a set of concepts, rules, theories and structures, which constitute a bag of tools, or mathematics is made up of facts to be used by trained artisan (skill worker) in pursuing external ends. The instrumentalist views can be summarized as follows.

- i. Mathematics is logical, its study trains the mind to work logically
- ii. Mathematics is predictable, absolute and fixed
- iii. Mathematics comes about as a result of basic needs that arise in everyday life
mathematics is a tidy activity. The method always guarantees right answer.

According to Fallibilist, mathematics is a dynamic subject which belongs to the continually expanding field of human creations. Mathematics are not infallible and as such, their products including proofs can never be considered final or perfect but may require renegotiation as standards of vigorous change. This simply implies that, with the Fallibilist, mathematics is not a finished product. It is a untidy activity and hence needs results that are to be opened for revision.

The Platonist also maintain as the view that mathematics is static but unified body of knowledge. They represent mathematics as a subject that consists of descriptions through connecting mathematical objects into the body of knowledge. Mathematics is logical and organized system of procedures that explain ideas in the physical world. Mathematics is accurate, precise, consistent and abstract. In conclusion, mathematics can be seen as a process such as abstracting, generalizing, classifying. Problem solving and investigation. These processes together form a way of thinking. It is a subject, which deals with the way of finding answers to problems. Using our knowledge of shape and measure in everyday life. It is a way in which we use information our ability to calculate and most importantly for our students in seeing and using relationships. In addition, mathematics is the logical arrangements of numbers, shapes, space and symbols to make meaningful and sound decision.

Importance of mathematics

According to Jackvani (1982), there cannot be any meaningful development in life without the knowledge of mathematics. Meaning, mathematics is needed in almost all aspects of man's daily activities. Mathematics appears in all subjects taught in schools with the exception of a few. In addition, because of its need in everyday life, it is learned at all levels of education in education in Ghana.

According to the aims of the mathematics syllabus of the primary school, mathematics is taught to enable pupils terminating their education at the junior high school level to cope effectively in other professions and vocations. It is also help to reason logically. Mathematics knowledge also

enables pupils to manipulate calculators effectively. These machines make man's work ways and can manipulate figures that go beyond the capability of the human brains.

In quoting Piaget (Developmentalist), Jackvani (1982) states that mathematics concepts are very important in human life and therefore needs to be developed right from the infancy of each child. Based on this Piaget stated four various ages and their respective stages of development as well as their characteristics absorbing at each level. The first stage of age group is the 0-2 years and stage of development is the sensory motor stage. The second is 2-7 years and the stage of development is the pre-operational stage. This is followed immediately by the concrete operational stage, which comprises age 7-14 years. The final group is informal operational stage, made up of ages 14 and above.

According to Bawuah (2008), mathematics is being increasingly used in and economics. Mathematics assist human to design and play games like "oware" ludu etc. in addition, mathematics helps to recognize shapes and know some of their properties. In building an oven for instances, mathematics is involved in drawing a circle, drawing a curve, drawing shapes etc. mathematics develops as far as possible our ability to use our knowledge in dealing with specific problem.

Place value as a concept in mathematics

Asafo-Adjei (2001), defined place value as a value of a digit in written numeral. It determines the value of a digit in a numeral by virtue of its position. According to Farjeon (1968), without the place value concept, man would have led to many numerals then could be conserved by the human being. He explained how all numbers could be written from the symbol 0-9 in his poem

entitles number of numbers. According to Osbon and Forester (1966), number ideas are written with symbols called numerals. Each single symbol in Arabic numerals is called digit. In our numeration system, each place in a number has a value ten times the value of the place at its right.

Evans (1966) used fingers to both hands to count and group by tens. In most numeration system today grouping is done by tens. The name of our number reflects this grouping process. Eleven derived from the media German phrase that is “Lifon” meaning one left over the twelve is from “twe lif” meaning two left over ten. The number names from thirteen to nineteen have similar derivation. Twenty is from “twe-tig” two tens and hundred means ten times ten. When ‘grouping’ is done by ten the system is called base numeration system.

Hidden and Spear (1988), wrote that concept of decimal place value is an important idea that is base to whole numbers integers and rational numbers expressed as decimal. Understanding the concept of place value is essential to comprehending the algorithms we teach.

The principles of the place value make our numeration system superior to any other system. Zero as we used in our numeration is another concept that makes our numeration system unique. The word place value according to the Collins Advanced learners English Dictionary is any point. Building area among other. Value on the other hand is important or usefulness in quality, quantity or attitude. Place value is therefore the importance of a moments at any given point or area. It couldn't in a subtraction, addition, multiplication and division statements.

According to Colvin (1987), place value is the importance of a number or numeral at any given place or point. A number therefore has different values at wherever it appears in a giving

arrangement. On their part, Maffai and Buckley (1980) content that place value is the importance of a figure a numeral at various positions in any ordered pair of numbers. Bratton (1971) explained that, place value is the importance of a number in arrangements. To him, depending on the array of numerals of numbers, the position an array assume, determined its importance.

Problem of teaching mathematics

Appronti and Afful (2001) were of the view that many teachers do not incorporate fun into mathematics to make it recreational. For this reason, they fail to be successful in developing the concepts and make children like and love mathematics. In general, many teachers do not emphasize place value in their teaching. They either refuse to use concrete materials to develop the concept or the materials used are not up to standard.

According to Bawuah (2008) many factors have contributed to the difficulty in the learning and teaching mathematics. Some of these problems be stated include understanding of mathematical terminology and symbols. He said most at time many pupils fail to understand the actual meaning of the symbols and terminologies before using them. In addition, many teachers especially those at the basic school fail in explaining these mathematical terminologies and symbols well before applying them in the cause of teaching. He continues by saying that, the easy accessibility of some teaching learning materials have also been a problem. Over the years associability of some modern scientific teaching aids has served as a hindrance to the better teaching and learning of some mathematics topics.

Croft (1982), also talks about the misconception on the part of many parents leading to gender bias as a problem in teaching and learning of mathematics. According to Croft many parents wrongly perceive mathematics to be a male denominated activity. Hence, boys are given more scientific and constructional toys. When help to develop spatial concept and problem solving activities in addition boys are encouraged to be more independent than girls. Boys are encouraged solving strategies. He added that, adults respond to boys as if they are interesting and attract more attention than girls attract.

Cause of pupils inability to understand the concept of place value.

Chamberline (1992), mentioned that the inability of pupils to understand well the concept of place value depends on how they were introduced to the concept at their children at their formative years develop like or dislike for things. A child who may not be helped or encouraged to show interest for a particular concept like place value will grow and dislike it.

Bratto attributes pupil's inability to understand the concept of place value to the attitude of teachers. A survey conducted in East Africa revealed that most teachers at the pre school level does not teach mathematics in a practical manner. They use the laborious ways or conventional means to teach children. The usual rattling of multiplication table is the order of the day.

Maffai and Buckley noted that, the inability of pupils to understand the concept of place value may be genetically. They concluded in a survey carried out in a pre-school in the United States of America (USA) that most of the children who do show interest in mathematical problems involving place value their parents showing or expressing similar attitude during their pre-school days. Byrd (1970) agreed that pupils perception about what they are doing and the

level of encouragement go a long way to boost their understanding of a concept. He contended that if children are given the necessary motivation, they will understand the concept of place value.

Effects of lack of knowledge of the concept of place value on pupils academic performance

The concept of place value cuts across most mathematical concept. The concept that is addition, subtraction, division and multiplication. These are the basic principles use in mathematics. All complex mathematical problems own their origin to the four main operations of mathematics. It could therefore be realized that lack of knowledge in place value is lack of knowledge in mathematics chamberline summed it up by saying “place value is mathematics and mathematics is place value”.

The statement cannot be argued further because the basic operations of mathematics have elements of place value in them. The role of mathematics cannot be over-emphasized. At all terminal point mathematics is a contributory factor for further studies. Points worth mentioning are from the Junior High School (JHS) level to the senior high school to the university or any tertiary institutions.

Importance of teaching learning materials in teaching mathematics

Dondieu (2002) states that, the more use of teaching and learning materials does not guarantee effective teaching and learning. Rather it is their careful selection and skillful handing by the teacher that ensures the usefulness in facilitating learning. The preparation and affective use of the materials however presents problem to teachers especially beginning teachers. In addition,

Nacino-Brown and Brown (1982) emphasized that material are effective only when they are understand and appreciated by the student using them. The teacher should therefore review, preview or examine these materials to determine whether they are within the range of their experimental background.

Furthermore, Diemes (1928) explained how mathematics must be learnt and taught Dienes concluded that learning must begin form the application of the child's actual experience. He suggested that learning a new mathematics concept must involve working several models of the concept.

Finally, Fianu (2005) explains that, a poor school environment for teaching hostile attitude from the teachers towards the child will impede the progress of the child in school. In conclusion, it has now come to light that teaching learning matter was plays an importance role in teaching and learning. Also, care should be taken in their selection and use, for the teaching and learning materials, to achieve it aim, conductive learning environment must equally be created.

CHAPTER THREE

METHODOLOGY

This chapter deals with the research methodology, which describes the research design, population, instrument the procedure for administering the instrument as well as the interventions.

Research design

The type of research design used into his project is an action research. Action research is a kind of research activity in which the researcher works in collaboration with other people to solve perceived problems in the classroom. In the school situation, action research encourages teachers to be aware of their own practice, and to be critical of that practice and to prepare for a change.

Action research does not focus on only generating new knowledge. It also enables both participants to develop appropriate intervention strategies that are aimed at finding solutions to the identification of the problems in the teaching and learning situations. The weakness of this design is that, it involves much time or it decided to use this design to enable her find solutions to the problem identified.

Population and sample selection

The research population for this study is the pupils in stage four at Akim Sekyere R/C Primary schools in the Atiwa District. Sample of five (5) pupils were selected randomly. For the population sample, the researcher made yes or no on the sheet of paper and made the population sample to selected the sheet and all those who picked yes became the sample. The class population was twenty-two pupils. This comprise twelve (12) boys and ten (10) girls. However, the random selection picked two boys and three girls. The average age of the pupils is ten (10) years.

Research instruments

Aside the use of intervention procedures which include pre-intervention, intervention on post-intervention procedures, the researcher use observation and interview in gathering the information for the study.

Observation

Observation was used because it is one of the most effective ways of collecting quantifiable information about this research. The learning habit of participants was critically observed both at home and at school. The research also found out that, the school did not have enough TLMs let alone improvised teaching learning materials which cold be used during mathematics lessons. Due to this, the lesson was usually teacher-centered which made the students to switch off within a short time, as we know children learn better when they interact with objects and materials and participate in a lesson.

Moreover the researcher noticed that the class teacher did not use any improvised teaching learning materials during his lesson to make the activity oriented, which will motivate and sustain the interest of the pupils. Due to the usage of improvised teaching learning materials by the researcher to teach addition of numbers, the pupil performance was better than the pre-test conducted. The sample of the pupils exercise could 'be' found in the appendix column

Interview

In order to get more information about pupils and bring to light the aim of this project work, the researcher interviewed the pupils and the class teacher respectively. During the interview of the

pupils, the researcher invited the pupils during break time in the classroom in order not to misuse the instructional time. Some of the questions asked were whether they like mathematics and whether they understood it when no teaching and learning materials is used. They were also asked whether their parents have been buying them educational materials, whether the class teachers involved them in this lessons and how he related with them.

The class teacher was not left out of the interview. First of all, the researcher asked the class teachers whether he was aware of pupil inability to solve problems involving on the addition of four digit numbers. The researcher then went on to ask whether the child is regular at school. The researcher also inquired from the class teacher the type of methods used in teaching the concept addition of four digit numbers. The researcher then went on to ask whether any of the pupils have been repeated before and whether they are punctual and regular at school.

The researcher also inquired from the class teacher the type of methods used in teaching the concept addition of four digit numbers. The class teaches was further asked whether he used TLMs or improvised teaching learning materials in teaching the concert.

Intervention processes

Pre-intervention

The poor computing of addition of four digit numbers with emphasis on place value by the pupils prompted the researcher to carry out a pre-test in the pre-intervention stage to test the pupils' ability. The performance of the pupils was not encouraging. A sample of the pre-test

exercise could be found in appendix A. the pre-test helped the researcher to detect where the problem was

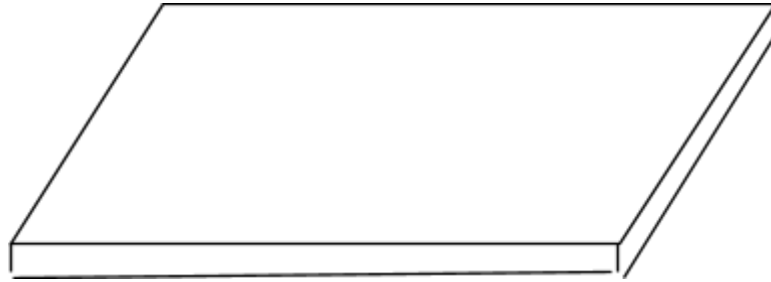
Intervention

Due to the low performance of the pupils, the developed intervention activities to uplift the performance of four digit numbers with an improvised teaching learning material called abacus so that they will understand the topic very well without any problem the help of a well lesson notes.

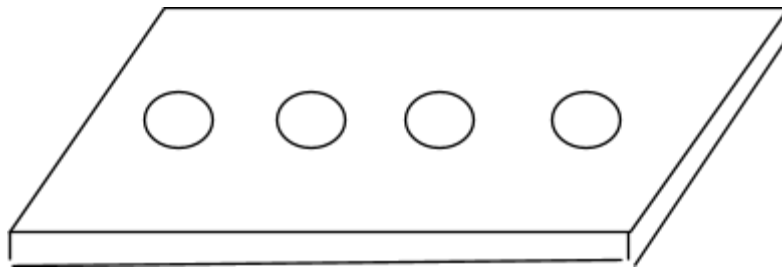
Procedures for construction of the abacus

A piece of wood was measured, length 19 inches and breadth 7 inches. A saw was used to cut it to desired measurement. It was planned to give it a smooth surface, it was then sand papered. The drilling machine was used to make four (4) holes on the flat wood with equal intervals.

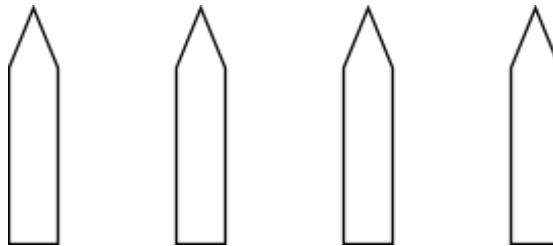
Four sticks were cut out from a piece of wood and measured to the same dimension they were planned to make them smooth and round. The sticks were fixed into the holes on the base wood. The white glue was to make them firm and vertical. The pebbles were prepared and placed on rods. These pebbles had the following colours, white, red, yellow and green, white represents (ones, red represent (10), yellow represents (hundreds) and green represents (thousands)



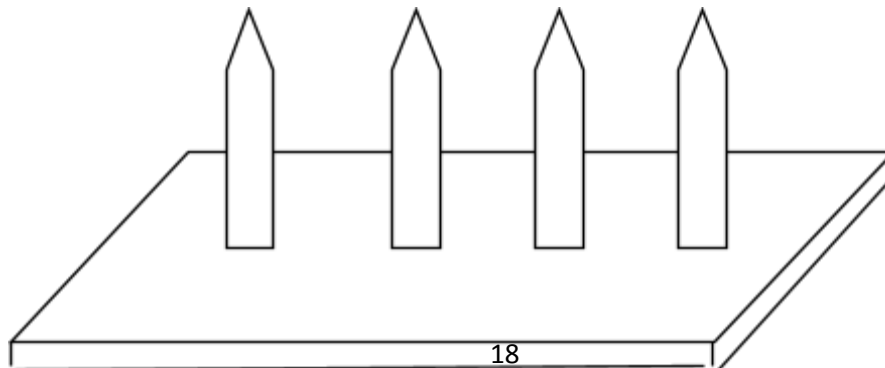
The Base Board



The base board with holes



Sticks



Rods fixed in holes

How the teaching learning materials was used

After the preparation of the lesson note (which is outline in appendix A) and teaching learning materials, the researcher gathered the target group in one classroom, and taught a lesson on the addition of four digit numbers with emphasis on place value.

At the introduction stage, pupils were asked to add 4 digit numbers. The abacus was placed on a table at the view of the pupils. Pupils were taught the value of the pupils. Pupils were taught the value of each rod, of the abacus. The rod on the far end represents tones followed by tens, hundreds and then thousands to the left. The colours were white, red, yellows and green respectively. All pupils were individually called to identify the colour pebbles according to its values. Next pupils were given figures to be expanded before adding. This was done under the supervision of the researcher.

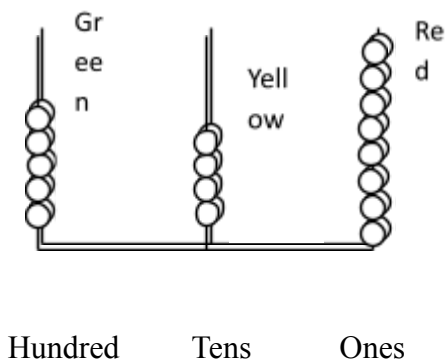
$$5482 = 5000 + 400 + 80 + 2$$

$$3645 = 3000 + 600 + 40 + 5$$

$$423 + 400 + 20 + 3$$

$$57 = 50 + 7$$

Again 5642 was given for pupils to represent it on the abacus. This is shown below

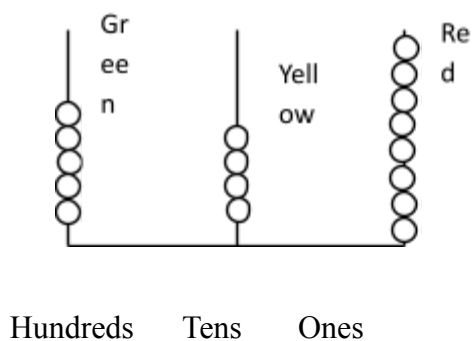


We continued by adding examples

Examples;

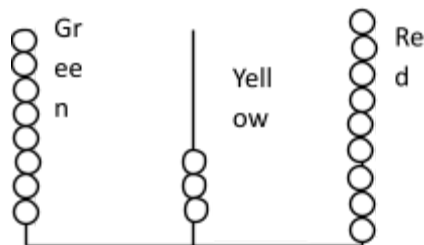
$$\begin{array}{r} 3643 \\ + 4753 \\ \hline 8396 \end{array}$$

First pupils were asked to combine the ones to get 6 ones, combine tens to get 9 ones, combine hundred to get 13 hundreds which is made up of 13 yellow balls. Pupils were asked to exchange the ten red balls for 1 yellow ball which was a hundred, the three yellow balls were left. That, one yellow ball was transferred to the thousand red. Combine the number of green balls the thousand columns which would give 8 green thus 8 thousands.



A presentation of 3 6 4 on the abacus

$$\begin{array}{r} + 475 \\ 839 \\ \hline \end{array}$$



The final answer was renamed as 8 thousands, 3 hundreds, 9 tens and 6 ones, which is eight thousand three hundred and ninety six.

On other occasions the pupils were taken through the following additions

- | | | | |
|------------|------------|------------|------------|
| 1. 448 | 2. 617 | 3. 341 | 4. 236 |
| <u>323</u> | <u>342</u> | <u>614</u> | <u>432</u> |
| — | — | — | — |

Post-intervention

The researcher conducted a post test to find out if the intervention made by the researcher had yield any positive results. The results obtained by the researcher from the pupils are represented in chapter four. Pupils work can be also be verified in appendix C.

Data obtained from the pre-test, post test as well as the intervention and interview conducted were represented in tables and figures in chapter four (4). Frequency tables were drawn and percentages calculated for values obtained.

Limitation

The researcher wishes to cover a wider area in term of schools in the circuit in term of schools in the circuit. This was however not possible due to time constraints since the study was done at the programme. This therefore limited the scope to Sekyere Roman Catholic primary school.

Throughout the period of the research work, the researcher depended on her slavery. This same slavery was used for transportation, preparing teaching learning materials and printing of the project work. As a result, some adjustments were made with attached the result of the study.

CHAPTER FOUR

DATA PRESENTATION AND ANALYSIS

Introduction

This chapter deals with data collected from the pre-test and the post-test. The scores of pupils were analyzed. The analysis is presented in two parts as shown below

Analysis of data collected from pre-test

The pre-test was to serve as a preliminary measure which will expose to the researcher the actual needs of pupils as far as the research topic was concerned. Ten questions were given to pupils the questions were to give the researcher an idea of pupils performance in lessons of

addition of four (4) digit numbers in the class. Even though pupils performance in other aspects were quite good, their performance in addition of four (4) digits numbers was not good at all . when the pre-test was conducted for pupils most of them could not solve the questions. Almost all the sample group members performed poorly in the pre-intervention test.

The table below shows the results and performance of pupils in the pre-test conducted for the pupils in the sample population

Pre-test

The researcher analyzed the items under the pre-test after analyzing the questions on the questionnaire. Under the pre-test, it was realized that pupil performance were very poor and that pupils scored low marks. This is illustrated below.

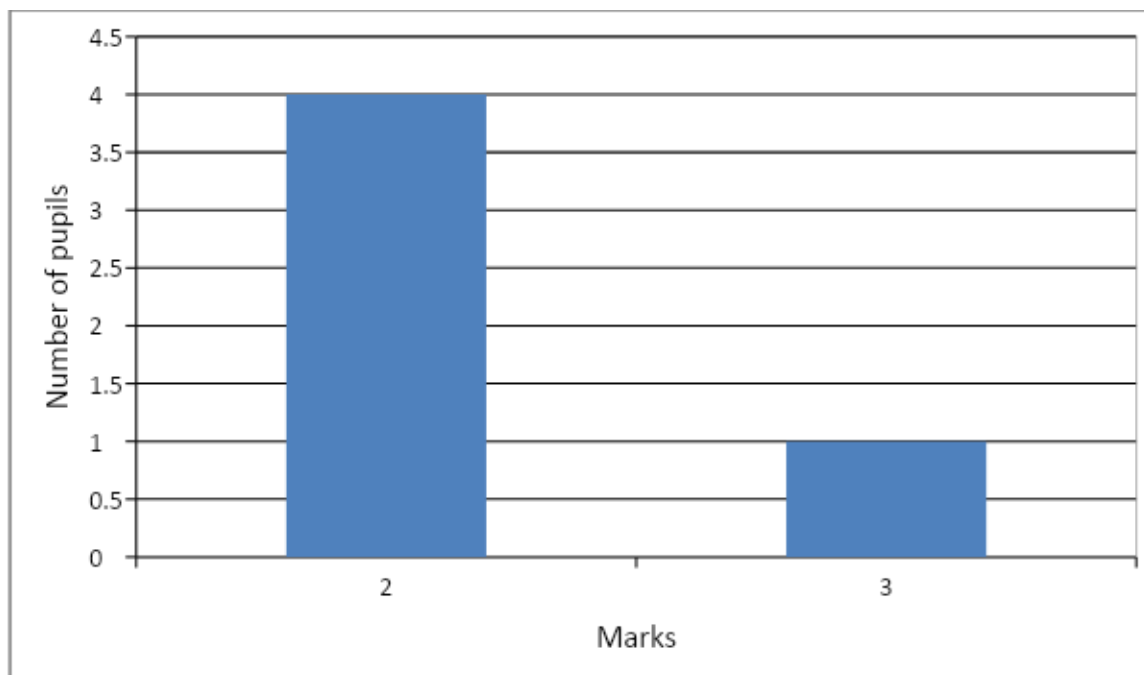
Table 1

Pre-test scores obtained by pupils

Marks out of 5	Tally	No. of Pupils (f)
2	////	4
3	/	1
Total	5	5

Figure 1

A bar graph showing pre-test scores obtained by pupils



Results of the pre-test indicated that pupils performance were very poor. That is out of 5. Marks, 2 pupils from the group had four (4) out of five, and three (3) pupils had one (1) out of five. This showed that pupils performed poorly.

Post-test

After the intervention the researcher conducted post-test. This was to enable the researchers ascertain the extent to which the pupils have understood the concept of place value. The results are in table 2 and figure 2.

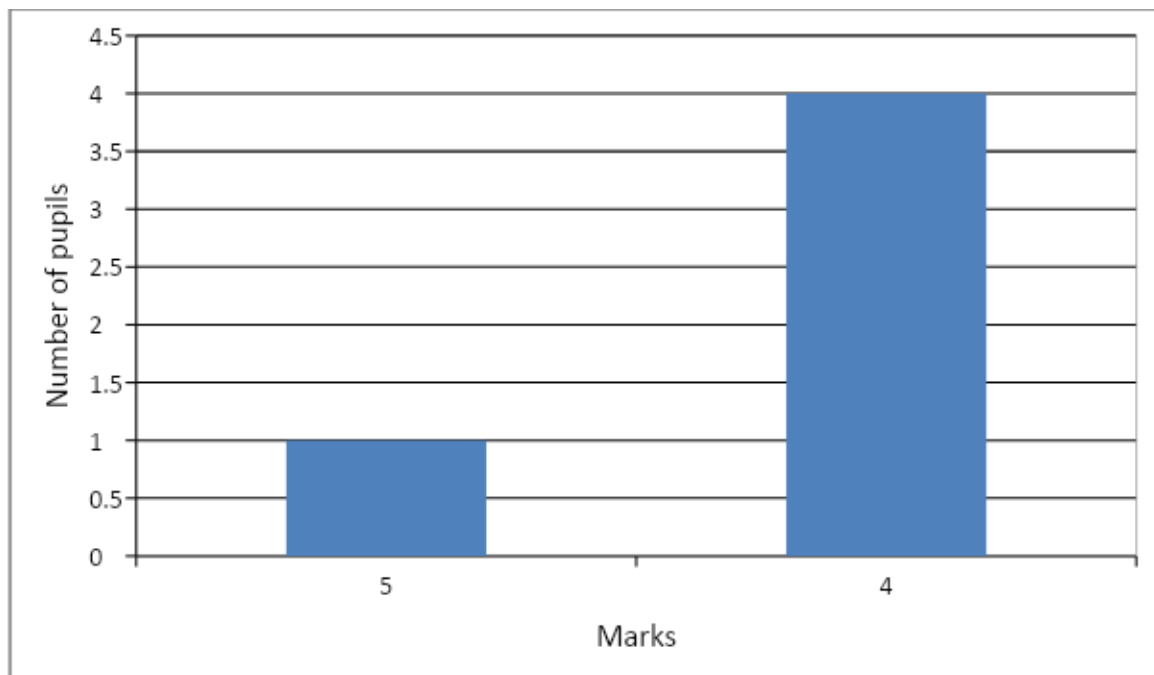
Marks	Tally	Pupils (F)
5	///	4
4	//	1

Total	5
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The information above is illustrated on a graph

Figure 2

A bar showing post-test scores obtained by pupils



From the graph, three (3) scored four (4) out of five (5) and two (2) pupils scored five (5) out of five (5). This shows a tremendous improvement. The indication is that the use of abacus has improved understanding of addition of four digit numbers with emphasis on place values.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

This chapter summarized the information obtained from the study. It is also used to draw conclusion in the light of the findings and make some necessary recommendations.

Summary

The study was an action research undertook in the in-in out programme at Akyem Sekere Roman Catholic Primary School.

It came to the realization of the researcher that, some of the pupils in the class had problems with place value after adding and subtracting digits. To come out with the actual picture of the problem, the researcher used the instruments such as observation, and questionnaires to gather information

Also, the researcher used of the improvise teaching learning materials (abacus) to develop the concept. After the use of the teaching learning materials, the researcher noticed a great change in pupil performance.

Conclusion

From the analysis it was seen that when pupils were introduced to the performance as the interventional tool their performance improved. This is evidence on pupils performance in the post-test conducted on the sample population. The result achieved from the research was a positive one. The achievement was as a result of the effective intervention put in by the researcher. The use of teaching learning materials in addition of four (4) digits numbers helped the pupils to understand the concept better.

Recommendation

Teachers should observe children performances in the class room in various areas based on this, the problems of pupils can be detected. Also it will help detect those with peculiar learning difficulty so that appropriate intervention would be used to help them.

Also special attention should be given to pupils who have peculiar learning difficulties so that the needed help could be given to them. Since children are very interesting in what they learn, it is recommended that concrete teaching and learning materials should be used during lesson delivery. Children pay attention and also participate in lesson when concrete and attractive materials once are used.

The researcher hopes that if the few points above given are taking into consideration, the problem of addition of four (4) digit numbers will be minimized in basic four and other levels.

Suggestion for further research it is suggested that in future anyone willing to undertake a similar project should include the whole class while paying attention to those under study. This will give the opportunity to others to benefit.

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