A Correlation Analysis that Explains the Performance of Pupils in Decimal Among Junior Secondary School Pupils at Huntingdon Vocational Secondary School, Foo-Foo Water Newton Western Rural District

By

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ABSTRACT

The study aimed to identify the difficulties that students at a particular school face when learning decimals and provide potential solutions to enhance their understanding. The study involved administering exams and practical tests on decimal operations to 50 randomly selected students from different grade levels. The data was analyzed using frequency tables and Spearman's rank correlation to identify areas of difficulty. The findings were used to draw conclusions and offer suggestions to address the challenges of learning decimals.

CHAPTER ONE

INTRODUCTION

A. Background to the Study

Mathematics is the science of deduction and computation. It is the science or study of numbers, amounts, or shapes. Mathematics, according to Kitta (2004), is the language that allows us to communicate concepts and relationships gathered from the outside world. Making the invisible visible using mathematics permits one to solve problems that would otherwise be impossible. Iheanachor (2007), on the other hand, finds a significant favorable relationship between teachers' backgrounds and students' academic performance in mathematics.

➢ *Decimal Fraction Concepts*

A significant amount of research on decimal fractions has focused on conceptual errors in recent years. Many studies and evaluations have been undertaken to identify the errors that students make while determining and comparing the magnitude of decimal fractions. (See, for example, Irwin, 2001; Isotani, McLaren, and Altman, 2010; Steinle, Stacey, and Chambers, 2006),some study suggests that widespread knowledge leads to the misunderstanding. Brekke (1996, p.138) noted, for example, that kids have been exposed to decimal numbers in conjunction with various sorts of measurement long before such numbers are taught in schools. In almost all of these measuring applications, the decimal point serves as a divider between different units of measurement.

The terms length, mass, and money are used as examples. Because measuring contexts include units and sub-units with distinct names (e.g., dollars and cents, kilograms and grams), Steinle (2004) discovered that it was simpler for students to misunderstand the relationship between what is on each side of the decimal point. As a result, a number like $2.35 can be represented by two whole-number units, with two dollars to the left of the decimal point and thirty-five cents to the right. Steinle and Stacey (1998) discovered that when money was reported to thousandths of a dollar (for example, $4.993), any figure after the hundredths place was usually ignored since it was thought to be "nothing."

In general, Mathematics is one of the most relevant disciplines in the world of academia, with topics such as Everyday Arithmetic (used in Business), longitudes and latitudes, Geometry and Bearing (used in aerospace and building). In (business and sharing goods), fractions, ratios, and decimals are employed. Logic is necessary for reasonable and critical thinking. However, decimals have been causing confusion in the minds of young students and even some teachers who have become addicted to using calculators to compute decimals, particularly when multiplying and dividing decimals.

Comparing and rounding off decimals is another issue for students, but the entire issue stems from past knowledge of decimals in primary school. Let us now look at the table below, which shows the place value of a decimal number for example 57.4.

Table 1.1 shows that the digits 5 and 7 on the left represent whole integers, while the digits 4 and 9 after the decimal point represent decimal place value. The tenth place is also one decimal place, while the hundredth place is two decimal places (2 d.p), and so on.

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Table 1.1:

PLACE VALUE SYSTEM OF DECIMALS													
millions	hundred thousands	ten thousands	thousands	hundreds	tens	ones	and	tenths	hundredths	thousandths	ten-thousandths	hundred-thousandths	millionths
					5	**7**	**.**	**4**	**9**				

B. Statement of the Problems

Teaching and learning of mathematics has been of huge problems in Secondary Schools to both teachers and students, especially in schools where there are no trained and qualified mathematics teachers or schools that are understaffed. This is most common to schools in the rural areas equipped with so many community teachers or volunteers. In Mathematics, Numbers can be classified into different types, namely real numbers, natural numbers, whole numbers, rational numbers, and so on. Decimal numbers are among them. It is the standard form of representing integer and non-integer numbers. Moreover, even some trained teachers do find it difficult in teaching some special case in decimals especially in multiplying and dividing decimals. They rather used calculator than computing them manually.

C. Aims of the Study

- To identify the various areas in computing decimals that pupils do not understand while learning in school and to suggest and recommend possible solution to the problem
- To discover the root cause of their lack of understanding in computing decimals at Junior Secondary School levels

D. Objectives of the Study

The main objectives of this study are;

- To identify the key operations in algebra that affect the computation of Decimal numbers
- To improve the kids' performances in addition, subtraction, multiplication and division of decimals as well as ordering decimals, place value systems etc
- To mitigate these problems by finding suitable solutions to improve their knowledge in computing decimals.

E. Significant of the study

This research willhelp broaden and enlighten the knowledge of researchers, statisticians, teachers as well as students in computing decimals.

F. Limitations of the study

The most essential thing in project writing is funding, which was not easy for the researcher. However, it takes a whole lot of perseverance and dedication to obtain permission from teachers to administer tests to their pupils impromptu. The researcher spent a lot of time and resources on this project, especially in printing and photocopying questions and helping teachers with their work to allow the free flow of administering the tests to their pupils.

Finance has been the greatest constraint considering the researcher status and my address at Jui Community, where I pay three times a week to visit Huntingdon Vocational Secondary School at Foo-Foo Water Newton. Transport fare was a problem, and even getting a taxi cab was another headache to some extent. I trekked to the point where my fare could afford it just to make this work.

The most expensive part of my expenditures was the printing and binding of this work. Another biggest challenge was getting the pupils to take the four tests; to an extent, I had to buy books and pens just to encourage them. I also gave tokens to some teachers and test takers.

G. Definitions of Terms

Administer	to give something
Computing	when you are solving mathematical problem
Decimal Number	is a number which has a whole number and a fractional part separated by a decimal point
Decimal	is a fraction written in a special form that has a based 10 system
Impede	to stop something not to happen
Methodologies	various possibilities of solving problems
Population	total number of items under investigation
Questionnaire	a list of question relating to a particular research with a specific aims and objectives in soliciting answers from respondents
Sample	items drawn from a population under investigation
Solicit	ask for or try to obtain (something) from someone
Stratum	sub-set of a stratified population
Tantamount	resulting to negative effect
Test Takers	pupils taking a test

CHAPTER TWO

LITERATURE REVIEW

A. Introduction

This chapter discusses what excellent teachers and book authors have said on the challenges associated with students learning decimals in junior secondary schools. This review serves as empirical proof to demonstrate the work's genuineness. Misconception is one of the most common issues that students have when studying decimals. These misconceptions can be identified by carefully listening to and observing their responses to specific questions and solving logical questions in decimals, particularly multiplication and division of decimals without the use of calculators.

However**, Stacey and Steinle et.al (1998)** propounded the following common misconception associated with pupils in learning decimals and also gave profound solutions to those problems;

➢ *Longer-Is-Larger (in comparing decimals) Misconceptions*

These students generally pick longer decimals to be larger numbers. There are a variety of reasons why they do this. Some children have not adequately made the decimal-fraction link and others have place value difficulties. The most common reasons for longer-is-larger behavior are outlined below. Longer-is-larger misconceptions are most common in primary school. For example, these children will say 0.43 is greater than 0.5.

➢ *Whole Number Thinking*

Learners with this way of thinking assume that digits after the decimal point make another whole number.

At one extreme, some children see the decimal point as separating two quite separate whole numbers. For example, instead of thinking of a decimal number such as 4.8 or 4.63 as a number between 4 and 5, they may see the numbers as two separated whole numbers 4 and 8 or 4 and 63. If asked to circle the larger of the two numbers, such a child might circle the 63 only, instead of either 4.8 or 4.63. These children are rare and need individual remedial help.

Whole number thinkers are likely to expect that the number after 4.9 (4 whole and 9 parts) is 4.10 (4 whole and 10 parts. They are also likely to have difficulty coordinating the number of parts and the size of the parts in a fraction, because they do not understand the decimal-fraction link. If the predominant discussion in the classroom is with decimals of equal length, the misconception is not challenged, and may continue to secondary school.

There are some variations in the way whole number thinkers order decimals. Sometimes these students select just on length alone, e.g. they will pick 0.021 to be larger than 0.21 just because it is longer. Other students look more carefully at the decimal part as a whole number, so that they will think that 0.21 and 0.0021 are equal, because the two whole numbers 21 and 0021 are equal.

➢ *Column Overflow thinking*

some students will usually choose longer decimals as larger, but will make correct choices when the initial decimal digits are zero. For example, these children will say 0.43 is greater than 0.5 but will Column overflow thinkers have learnt the correct column names for decimal numbers, but attempt to write too many digits into a column. So 0.12 is 12 tenths (as there is no zero after the point) while 0.012 is 12 hundredths (as there is one zero after the point). In effect, they squeeze the number 12 into one column. This is why we call it column overflow.

Column overflow thinkers interpret 0.35 as 35 tenths, 0.149 as 149 tenths and 0.678912 as 678912 tenths, 0.035 as 35 hundredths, 0.0149 as 149 hundredths and 0.0043 as 43 thousandths.

These difficulties are like the difficulties shown by small children learning to count who often say:*" Sixty-six, sixty-seven, sixty-eight, sixty-nine, sixty ten, sixty eleven, sixty twelve...".*

Similarly, when children first learn to add, they may put more than one digit in each place value column:

Understanding how to rename this number from "sixty twelve" (arrived at by the addition) to seventy-two depends on understanding the relationships between the place values of the columns. Ten in the ones column gives one in the tens column. Column overflow thinkers may have mastered this idea for whole numbers, but need to learn it again for the decimal positions.

Column overflow thinking also arise simply by "forgetting" which column name to take when describing the decimal as a fraction. Instead of getting the name from the rightmost column (in this case the hundredths, as 0.35 is 35 hundredths) the student may just take the name from the leftmost column (the tenths).

➢ *Zero Makes Small Thinking*

Some children who order decimals in the same way as column overflow thinkers (above) actually seem to know little at all about place value. These zero-makes-small thinkers may have very little idea of the decimal as representing a fractional part. They respond to many of the questions as do whole number thinkers. They know, however, just one thing more than do whole number thinkers - that a decimal starting with zero in the tenths column is smaller than one which does not. For example, they will know that 0.21 is larger than 0.0021 or 0.012345. Unlike whole number thinkers, they therefore can choose that 0.0762 is smaller than 0.53 correctly. A child with this misconception will order decimals in the same way as a column overflow thinker, but talking to them will reveal the differences.

B. What is a Decimal?

Mathematics is all about playing with numbers. The numbers are classified into various types of numbers such as real numbers, natural numbers, whole numbers, and rational numbers, and so on. Decimal numbers are among all these numbers. Decimals are the standard form of representing integer numbers as well as non-integer numbers.

In the topic of Algebra, decimals are one of the types of numbers. **The decimal number has a whole number and also a fractional part separated by a decimal point**. The dot that is presented between the whole number and the fractional part is known as the decimal part. For Example, 45.7 is a decimal number where 45 is the whole number part and 7 is the fractional part.

➢ *Types of Decimal Numbers*

There are many different types of decimal numbers as follows:

• Terminating Decimal Numbers

The terminating decimal numbers have a finite number of digits just after the decimal point. Such a type of decimal number is known as an exact decimal number. The number of digits after the decimal point of the terminating decimal numbers is countable.

For Example: 98.678 ,34.9807 and -5.8764

All these decimal numbers are examples of the terminating decimal numbers or the exact decimal numbers. The reason behind this is the numbers of digits after the decimal point is finite. These decimal numbers can be written in the form of p/q and therefore they are rational numbers. The rational numbers are those numbers that can be written in the p/q form where the value of q is not equal to zero.

- Non-Terminating Decimal Numbers

The non-terminating decimal numbers are the numbers where the digits after the decimal point of non-terminating decimals repeat endlessly.

In other words, one can also say that the decimal numbers have an infinite number of digits after the decimal point. The non-terminating decimals are further divided into recurring as well as non-recurring decimal numbers.

- Recurring Decimal Numbers

The recurring decimal numbers are those numbers that have an infinite number of digits after the decimal point. However, these digits are repeated at regular intervals.

For Example:

4.787878…

9.505050…

- These are the examples of recurring decimal numbers as the number of digits after the decimal point is repeated after regular intervals or follow a specific order.
- These numbers can also be written by simply putting a bar sign over the number that is repeated after the decimal point.
- These numbers can also be written in fractional form and therefore they are also rational numbers.
- The recurring decimal numbers can be pure periodic or ultimately periodic.

- Non-Recurring Decimal Number

The non-recurring decimal numbers are the non-terminating as well as the non-repeating decimal numbers. The non-recurring decimal numbers have an infinite number of digits at their decimal places and also their decimal place digits do not follow a specific order.

For Example:

56.78965…

789009.97658…

45.7789…

- All the above numbers are examples of non-recurring decimal numbers where we cannot put a bar sign over the decimal numbers because the digits after the decimal point follow no repetitive order.
- These decimal numbers cannot be written in the p/q form and therefore they are irrational numbers.

C. Addition and Subtraction of Decimals

According to **Krista** a female mathematician in India, she said “We can add, subtract, multiply, and divide decimal numbers. Addition and subtraction of decimal numbers works the same way as whole number addition and subtraction; we just need to make sure that we line up the decimal points”

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Example: Find the sum and difference.

13.16+8.74

13.16-8.74

To find the sum, we'll line up the decimal points, making sure that they're stacked directly on top of each other.

STEP ONE

$$\begin{array}{r} 13.16 \\ +\ 8.74 \end{array}$$

STEP TWO

$$\begin{array}{r} 13.16 \\ +\ 8.74 \\ \hline 21.90 \end{array}$$

Then we'll bring the decimal point straight down and add the numbers as usual, starting with the digits in the ones place, carrying anything extra to the tens place, adding the digits in the tens place (including anything extra from the addition of the digits in the ones place), carrying anything extra to the hundreds place, etc.

We can say that the sum is 13.16+8.74=21.90

To find the difference, we'll line up the decimal points, making sure that they are lined up directly on top of each other.

STEP ONE

$$\begin{array}{r} 13.16 \\ -\ 8.74 \end{array}$$

$$\begin{array}{r} 13.16 \\ -\ 8.74 \\ \hline 4.42 \end{array}$$

STEP TWO

Then we'll bring the decimal point straight down and subtract the numbers as usual, starting with the digits in the hundredths place, borrowing from the tenths place if necessary, subtracting the digits in the tenths place (excluding anything we borrowed for the subtraction in the hundredths place), borrowing from the ones place if necessary, etc.

We can say that the difference is 13.16-8.74=4.42

D. Multiplication and Division of Decimal Numbers

The teaching of multiplication is commonly done through repetitive addition of groups of the same size, which is considered a natural approach. (Izsak, 2004; Watanabe, 2003)

Students use the concept of multiplication to develop advanced computation methods based on the principles of commutativity, distributivity, and associativity. (Fischbein, Deir, Nello, & Marino, 1985)The concept of multiplication as repeated addition of equal-sized groups is insufficient because it cannot be extended beyond natural numbers. (Ambrose, Baek, & Carpenter, 2003; Carpenter, Franke, & Levi, 2003; Lampert, 1986)

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Find the product

13.1 × 8.74

To find the product, we should first right-align the decimal numbers. We should ignore the decimal points for now, and multiply the numbers as usual.

STEP ONE

$$\begin{array}{r} 13.1 \\ \times\ 8.74 \end{array}$$

TWO STEP

$$\begin{array}{r} 13.1 \\ \times\ 8.74 \\ \hline 524 \\ 9170 \\ +\ 104800 \\ \hline 114494 \end{array}$$

Now we should count the number of digits to the right of the decimal point in each of the two decimal numbers, and then add. There is one digit after the decimal point in 13.1, there are two digits after the decimal point in 8.74 that is a total of three digits after the two decimal points. Then, since we had a total of three digits after the decimal points, we move the decimal point three places to the left to get our final answer. Therefore, 13.1×8.74=114.494

E. Dividing decimals

Generally speaking, Dividing decimals is the same as dividing other numbers, except that if the divisor (the number you are dividing by) has a decimal, move it to the right as many places as necessary until it is a whole number. Then move the decimal point in the dividend (the number being divided into) the same number of places. Sometimes, you may have to add zeros to the dividend (the number inside the division bracket).

Note the decimal point in the quotient (answer) is placed above the one in the dividend. The number we divide by is called the divisor.

Example 1

Divide $1.25\overline{)5.}$ $\longrightarrow$ when the divisor is not an whole number and dividend is an whole number

$$1.25\overline{)5.} = 125\overline{)500.}^{\,4.}$$

- To divide a whole number by a decimal
  But we must do the **same thing** to both numbers in the division.

  Example: 15 divided by 0.2

  so multiply by 10

  When we multiply the 0.2 by 10 we get a whole number:0.2 × 10 = 2

  But we must also do it to the 15:15 × 10 = 150
  So 15 ÷ 0.2 has become 150 ÷ 2 (both numbers are 10 times larger):150 ÷ 2 = 75

  And so the answer is: 15 ÷ 0.2 = 75

  To divide decimal numbers:

  Multiplying by 10 is easy, we just shift one space over like this:

- To divide decimal by decimal number
  Example: Divide 6.4 by 0.4 Let us move one space **for both**:

move 1

6.4 ➡ **64**

0.4 ➡ **4**

move 1

Now we can calculate: *64*÷**4** = 16

So the answer is:*6.4* ÷ **0.4** = 16

Example: Divide 0.539 by 0.11

First we need to make the move twice to make 0.11 into a whole number:

move 2 spaces

0.539 ➡ **5.39** ➡ **53.9**

0.11 ➡ **1.1** ➡ **11**

move 2 spaces

0.539 and*0.11* ***is exactly the same as*** **53.9 and** *11*

Well, we can ignore the decimal point in the dividend so long as we remember to **put it back later**.

First we do the calculation without the decimal point:

```
  049
11)539
   0
   53
   44
    99
    99
     0
```

```
  04.9
11)53.9
```

Now put the decimal point in the answer directly above the decimal point in the dividend: The answer is 4.9

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- To divide a decimal by a whole number
  Example: Divide 9.1 by 7

The divisor (7) is already a whole number, so no need for any moves.

Now, ignore the decimal point in the dividend and use Long Division:

$$\begin{array}{r} \underline{\;13} \\ 7\overline{)91} \\ \underline{7\;} \\ 21 \\ \underline{21} \\ 0 \end{array}$$

Put the decimal point in the answer directly above the decimal point in the dividend:

$$\begin{array}{r} \underline{1.3} \\ 7\overline{)9.1} \end{array}$$

The answer is 1.3

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CHAPTER THREE

RESEARCH METHODOLOGY

A. Methodology

This chapter gives a vivid description of the general procedures used in carrying this research. Methodology itself is the methods and principles used for the collection of information through interviews, observation in a very systematic and orderly manner. This chapter comprises the area of investigation, the procedures used in carrying out the research and the instrument used in collecting and computing the data.

B. Study Area/Study Setting

The information collected in this research covers a random sample from JSS1 to JSS3 of Huntingdon Vocational Secondary School at Foo-Foo Water Newton with a total population of One Hundred Fifty (150) pupils, 50 pupils each form. Twenty-five (25) boys and twenty-five girls it will interest you to know that this school is partly government and partly mission.

C. Population and Sample

Using stratified random sampling technique:

Proportionate Stratified = $\frac{sample\ size * \ stratum}{population\ sample}$

Sample size: 50; Proportionate Stratified for boys =$\frac{50}{100} \times 40 = 20$

Population sample: 100;Proportionate Stratified for girls =$\frac{50}{100} \times 40 = 20$

Stratum: 40 each

Half of the population of each form were given four tests on decimals computation; addition, subtraction, multiplication, and division.

D. Sampling Procedures

The researcher used a stratified random sampling procedure. In this method a sampling of 20 boys and 20 girls of each form was administered test though not all pupils took the test due to difficulty in marking if the test takers are many.

E. Data collection Procedure

In order to insure credibility and authenticity of this work, the researcher administered four tests to the pupils to know their understanding in computing decimals.

Pupils were tested in the four areas of decimal computations; Addition, Subtraction, Multiplication and Division. Grades were converted into percentages then

The researcher personally marked the four tests and compute their grades and compared their performances by using Spearman's Rank Correlation Co-efficient

The tables below show their test scores in 5% in the four tests administered

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CHAPTER FOUR

PRESENTATION AND ANALYSIS OF FINDING

3.6. Data Presentations and Analysis

Normally data is presented by using both “table and graphs” which would show a quantitative numerical scale and shows the extent of pupils’ understanding in computing decimals.

TABLE 1: ADDITION OF DECIMAL JSS1

GRADES	F(BOYS)	F(GIRLS)	% OF BOYS	% OF GIRLS
1-10	3	2	15	10
11-20	4	3	20	15
21-30	5	2	25	10
31-40	3	4	15	20
41-50	6	5	30	25
51-60	10	12	50	60
61-70	2	5	10	25
71-80	5	6	25	30
81 AND >	2	1	10	5

Category 1 (40 and below): In category one, three (3) out of twenty (20) boys received a 15% grade on the Addition of Decimals course, while four (20) out of twenty (20) girls received a 20% grade. Category 2 (50-70): In the same course, 5 ladies out of the same sample scored 25%, compared to 2 boys out of 20 who scored 10% in addition of decimals.

Category 3 (70-80): Six (6) out of twenty (20) girls and five (5) out of twenty (20) males each received a score of 30% in the addition of decimals.

Only two boys and one girl in category 4 (81 and up) scored 10% and 5%, respectively, in the addition of decimals on a sample of 40.

TABLE 2: SUBTRACTION OF DECIMAL JSS1

GRADES	F(BOYS)	F(GIRLS)	% OF BOYS	% OF GIRLS
1-10	2	3	10	15
11-20	5	3	25	25
21-30	3	4	15	20
31-40	4	5	20	25
41-50	15	10	75	50
51-60	3	4	15	20
61-70	3	4	15	20
71-80	4	3	20	15
81 and >	1	2	5	10

Source: Field Survey

- CATEGORY 1 (40 and below): In category one, three out of ten boys scored 20% on the course on subtracting decimals, while five out of ten girls earned 25%.
- CATEGORY 2(50-70): In computing the same course of subtraction, 10 out of 20 girls in category 2 scored 20% whereas 15 out of 40 boys scored 75%.
- Category 3 (scores 70 to 80): In the course "Multiplication of Decimals," 2 boys out of 20 received a score of 20%, while 5 girls in the same sample received a score of 25%.
- Only one boy and one girl out of a sample of 40 students in Category 4 (81 and above) received a score of 5% in the division of decimals.

Table 3: Division of Decimal JSSI

GRADES	F(BOYS)	F(GIRLS)	% OF BOYS	% OF GIRLS
1-10	12	8	60	40
11-20	11	9	55	45
21-30	6	7	30	35
31-40	10	9	50	45
41-50	11	9	55	45
51-60	5	3	25	15
61-70	3	3	15	15
71-80	2	2	10	10
81 And >	1	1	5	5

- **CATEGORY 1 (40 and below)**: Ten(10) out of 20 Boys in category one scored 50%in the Division of decimal while, 9 out of 20 Girls scored 45% of the same course
-
- **CATEGORY 2(50-70):** 3 out of 20girls in category two scored 15% in division of Decimalwhile 3 out of 20 boys scored the same percent incomputing the same course of division
- **CATEGORY 3(70-80):** 2 Boys out of 20 scored 20% in Multiplication of decimalswhereas, 5 girls of the same sample scored 25% in the same course
-
- **Category 4(81 and above)** only two boys and girls scored respectively in the division of decimals; 60% of the boys' sample scored grades ranging from 1-10% and 40% of the girls scored the same grades as boys

TABLE 04: MULTILICATION OF DECIMAL 2

GRADES	F(BOYS)	F(GIRLS)	% OF BOYS	% OF GIRLS
1-10	3	10	15	50
11-20	14	8	70	40
21-30	5	4	25	20
31-40	3	2	15	10
41-50	5	6	25	30
51-60	3	3	15	15
61-70	4	5	20	25
71-80	2	1	10	5
81 AND >	1	1	5	5

Field Survey

- **CATEGORY 1 (40 and below)**: Three(3) out of 20 Boys in category one scored 15%
- in the multiplication of Decimals while, 10 out of 20 Girls scored 50% of the same course
- **CATEGORY 2(50-70)**: 4 out of 20 boys
- Scored 20% in the multiplication of decimals whereas, 5 Out of 20 girls scored 25% in the same course
- **CATEGORY 3(70-80)**: 2 Boys out of 20 scored 20% in Multiplication of decimals
- whereas, 5 girls of the same sample scored 25% in the same course •

- **Category 4(81 and above):** only one boy and a girl Scored 5% each out of a sample of 40 in the multiplication of decimals

➢ *PRESENTATION OF SPEARMAN'S RANK CORRELATION COEFFICIENT ANALYSIS*

Table 06: ADDITION OF DECIMAL

GRADES	BOYS (%)	GIRLS (%)	R_B	R_G	d	d^2
0-10	20	25	8	5.5	2.5	6.25
10-20	50	45	3	3	0	0
20-30	45	30	4	4	0	0
30-40	60	90	2	1	1	1
40-50	75	50	1	2	-1	1
50-60	35	25	5.5	5.5	0	0
60-70	30	20	7	7	0	0
70-80	35	15	5.5	8	-2.5	6.25
80 AND >	10	5	9	9	0	0
						$\sum d^2=14.5$

Using Spearman's Rank Correlation $r_s = 1 - \frac{6\sum d^2}{n(n^2-1)}$

$r_s = 1 - 6(14.5)/9(9^2-1) = 0.87917$

$r_s = +0.9$(1.d.p)

There is strong positive correlation between boys and girls in computing addition of Decimals

Table 7: Subtraction Of Decimal

GRADES	**BOYS (%)**	**GIRLS (%)**	**R_B**	**R_G**	**d**	**d^2**
0-10	60	40	1	4	-3	9
10-20	55	45	3.5	1.5	2	4
20-30	30	33	5	5	0	0
30-40	58	42	2	3	-1	1
40-50	55	45	3.5	1.5	2	4
50-60	25	14	6	6	0	0
60-70	12	13	7	7	0	0
70-80	10	12	8	8	0	0
80 AND >	2	6	9	9	0	0
						$\sum d^2=18$

Source: Field Survey

Using Spearman's Rank Correlation $r_s = 1 - \frac{6\sum d^2}{n(n^2-1)}$

r_s= 1- 6(18)/9(9^2-1) = 1-0.15 = 0.85

There is strong positive correlation between boys and girls in computing subtraction of Decimals for both JSS1 and JSS2

Table 8: Divisions Of Decimal

GRADES	BOYS (%)	GIRLS (%)	R_B	R_G	d	d^2
0-10	25	30	7.5	5	2.5	6.25
10-20	30	43	5.5	1	4.5	20.25
20-30	32	40	4	2	2	4
30-40	45	15	1.5	7.5	-6	36
40-50	30	34	5.5	3.5	2	4
50-60	33	29	3	6	-2	4
60-70	45	15	1.5	7.5	-6	36
70-80	15	34	9	3.5	5.5	30.25
80 AND >	25	15	7.5	9	-1.5	2.25
						$\sum d^2=143$

Source: Field Survey

Using Spearman's Rank Correlation $r_s = 1 - \frac{6\sum d^2}{n(n^2-1)}$

r_s= 1- 6(143)/9(9^2-1)

$r_{s=}$1-1.19167

r_s= -0.1967

r_s= -0.2(1.d.p)

There is strong negative correlation between boys and girls in computing division of Decimals

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Table 9: Multiplications Of Decimals JSS1

GRADES	BOYS (%)	GIRLS (%)	R_B	R_G	d	d^2
0-10	60	40	1	4	-3	9
10-20	55	45	3.5	1.5	2	4
20-30	30	33	5	6	-1	1
30-40	58	42	2	3	-1	1
40-50	55	45	3.5	1.5	2	4
50-60	25	34	6	5	-1	1
60-70	12	5	7	9	-2	4
70-80	10	13	8	7	1	1
80 AND >	2	10	9	8	1	1
						$\sum d^2=26$

Source: Field Survey

Using Spearman's Rank Correlation $r_s = 1 - \frac{6\sum d^2}{n(n^2-1)}$

r_s= 1- 6(26)/9(9^2-1)

r_s=1- 0.2167

r_s= +0.7833

r_s= +0.8(1.d.p)

There is strong positive correlation between boys and girls in computing multiplication of Decimals among junior secondary school pupils with correlation co-efficient of; 0.78.

CHAPTER FIVE

SUMMARY, CONCLUSION, AND RECOMMENDATION

A. Summary

Children have difficulties in learning decimals at all levels of education, starting from primary school. Decimal place and significant figures are often confused, with decimal place being the position after the decimal point and significant figures being chosen based on the required amount. Poor foundation in mathematics, as well as specific difficulties such as division of decimals by whole numbers, multiplication of decimals, comparing and ordering decimals, and understanding place value system, are some of the factors contributing to the problem. As a result, pupils struggle with tasks such as multiplying decimals without calculators, dividing decimals, rounding decimal numbers, and determining significant figures.

B. Conclusion

It is important to recognize that the difficulties in understanding decimals are not unique to Huntingdon Vocational Junior Secondary School, but are prevalent across all levels of education. The challenges with division of decimals and related concepts have been a concern for both mathematics teachers and government education sectors, contributing to high failure rates in mathematics. Although research on decimals is rare, it is a distinct topic from fractions due to its two parts - the whole number and the fractional part separated by a decimal point. Poor foundations in primary school, confusion with place values when multiplying and dividing decimals, and difficulty rounding decimals, particularly when zeros are involved, are some of the factors that make it challenging for children to grasp decimals. The teaching methodology is another concern, with some teachers relying too heavily on calculators and hindering children's critical thinking and computational skills. It is concerning to note that some junior secondary school children cannot multiply and divide decimals without calculators, highlighting the need for effective teaching and learning strategies to improve their understanding.

C. Recommendation

- The Ministry of Education and school heads should provide in-service training for teachers to emphasize decimals and fractions in primary and secondary schools.
- Teachers should focus on teaching students how to multiply, divide, and subtract decimals without relying on calculators.
- Teachers should teach students how to set decimal points in columns, especially with indefinite decimals.
- Teachers should help students overcome column thinking and avoid common misconceptions.
- Students should be given drill exercises to develop critical thinking in solving decimal problems without using calculators.

RESEARCH PLAN

The Huntingdon Vocation Secondary School located at Foo-Foo Water Newton has a population approximately 400 pupils

Source: Admission book of 2021-2022 academic

In order to find out the major problems associated with pupils in learning decimals, I administered four tests to the pupils. Below are the questions I drew;

Q1. Add the following decimals:
a) 1.34 and 2.321
b) 4.6 and 8.3
c) 0.23 and 2.51
d) 7.5 and 2.03
e) 5.732 and 1.2

Q2. Subtract the following decimals
a) 2.65-1.07
b) 36.2-10.02
c) 4.8-2.5
d) 85.3-50.35
e) 20.03-1.2

Q3. Multiply the following decimals
a) 5.6×2.1
b) 3.65×2.4
c) 6.3×2.9
d) 0.72×0.4
e) 5.1×3.8

Q4. Divide the following decimals
a) 6.3÷2.9
b) 4.85÷5
c) 95.1÷6
d) 2.7÷0.25
e) 10.8÷1.5

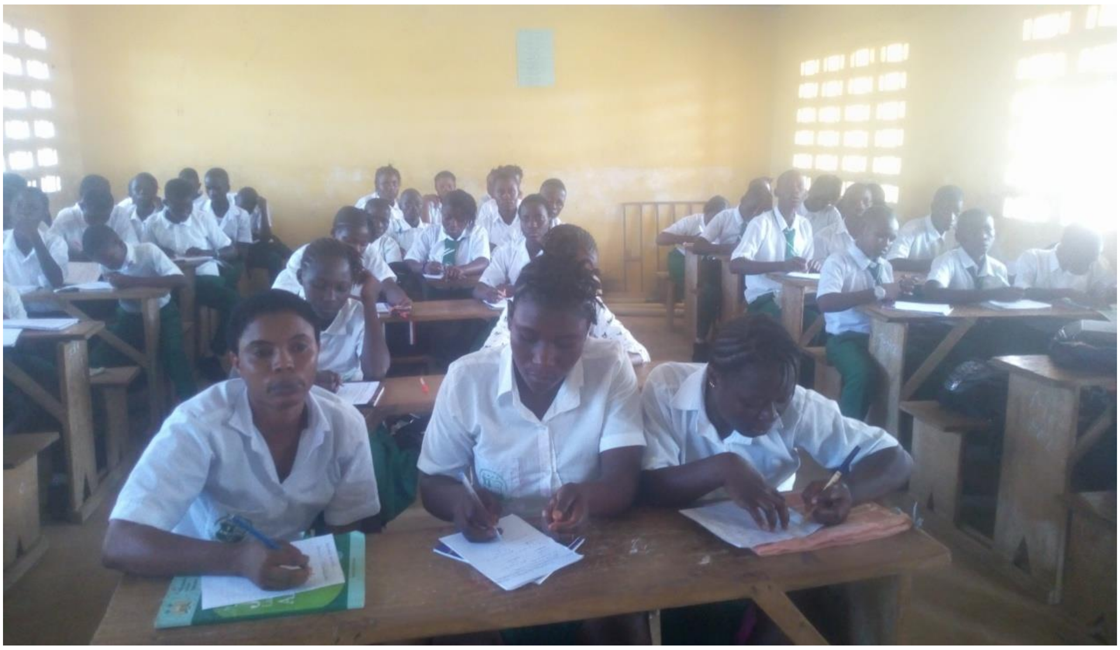

Fig. 1: showing the test takers of Huntingdon Vocational Secondary School

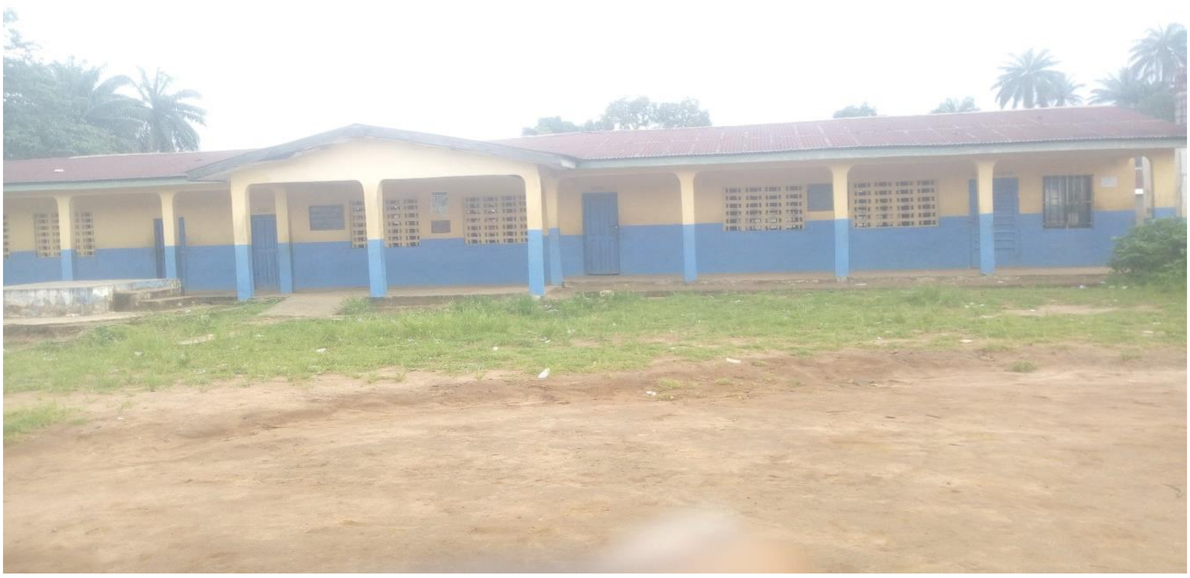

Fig. 2: showing the image of Huntingdon Vocational Secondary School Foo-Foo Water Newton.

PRESENTATION OF FIELD DATA

TABLE 01: ADDITION OF DECIMAL JSS1		
GRADES	**BOYS(%)**	**GIRLS(%)**
0-10	20	25
10-20	50	45
20-30	45	30
30-40	60	90
40-50	75	50
50-60	35	25
60-70	30	20
70-80	35	15
80 AND >	10	5

TABLE 02: SUBTRACTION OF DECIMALS JSS1		
GRADES	**BOYS(%)**	**GIRLS(%)**
0-10	20	23
10-20	21	34
20-30	30	34
30-40	7	32
40-50	8	15
50-60	12	12
60-70	13	13
70-80	10	11
80 AND >	5	6

TABLE O3 :MULTIPLICATION OF DECIMAL JSS1		
GRADES	**BOYS(%)**	**GIRLS(%)**
0-10	25	30
10-20	30	43
20-30	32	40
30-40	45	15
40-50	30	34
50-60	33	29
60-70	45	15
70-80	15	34
80 AND >	25	15

TABLE 04: DIVISION OF DEIMALS JSS1		
GRADES	**BOYS(%)**	**GIRLS(%)**
0-10	60	40
10-20	55	45
20-30	30	33
30-40	58	42
40-50	55	45
50-60	25	14
60-70	12	13
70-80	10	12
80 AND >	2	6

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