# **CHAPTER ONE**

## **Overview**

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This chapter consists of the background to the study, statement of the problem, the purpose of the study, research objectives, questions and hypothesis, significance of the study, delimitations, limitations of the study, and organization of the study.

## **BACKGROUND TO THE STUDY**

Mathematics is one of the disciplines that have a much impact on all the activities of man therefore, it is seen as an organized independent, and rational discipline in the field of education.

Mathematics has a way of communication that is, it has its language of communication, symbols, and strategies for teaching and learning, it plays vital in the world of work.

Mathematics according Palings (1985) concerns itself with finding answers to problems and questions which arise in everyday life situations. Some of the importance of studying mathematics is; that it helps to develop scientific and technological advancement as well as attitudes of logical thinking and inquiry skills in pupils in the world of knowledge.

Again, mathematics is a powerful concise, and unambiguous means of communication through the presentation of information in many different ways such as using figures and letters, tables, charts, diagrams, technical drawings, and geometrical.

Because of the above important knowledge of mathematics, the government of Ghana Education Service (GES) and the ministry of education are doing everything they can in their power to improve the standard of education in the teaching and learning of mathematics in every part of the country.

This research is basically to improve the understanding of Zogbeli Junior High Block “B” from one student in the addition and subtraction of integers. Operation on numbers of which addition and subtraction of integers form part is very relevant in life and cannot do without it as we add, subtract, divide, multiply, and make profit and loss every day.  Zogbeli Junior High Block “B” is located in Zogbeli around the West hospital and beside Aliu Mahama Road, Tamale. The capital of the Northern region. The school management is under the local authority and the most spoken language is Dagbani. The school has a student population of 300 pupils. It is this very community that the researcher is carrying out this teaching practice as the in and out segment program of B.ED in basic education in the College of education in Ghana.

## **STATEMENT OF THE PROBLEM**

This problem came to light when the researcher went to Zogbeli junior high school Block “B” to do his teaching observation. During a mathematics lesson, the researcher observed in the first two weeks that the pupils in JHS one have a problem adding and subtracting integers.

An evaluation exercise by the researcher on adding and subtraction of integers revealed that only twenty percent (20%) of the JHS one has the pass mark. This revelation compelled the researcher to investigate the use of integers manipulative in solving the pupils’ problems in addition and subtraction of integers.

## **PURPOSE OF THE STUDY**

The purpose of this study aims at assessing the use of integer manipulation to improve the form one student's difficulty in addition and subtraction of integers, with the following objectives;

1. To find out the cause of form one pupils' poor performance in addition and subtraction of integers.

2. To identify the effects of form one pupils' poor performance in addition and subtraction on integers.

3. To use integers manipulative to improve the poor performance in addition and subtraction of integers.

## **RESEARCH QUESTIONS**

The following questions have been generated to help the researcher to obtain accurate data for his research work.

1. What are the causes of form one pupils' poor performance in addition and subtraction of integers?

2. What are the effects of poor performance in addition and subtraction of integers on the study of mathematics?

3. Will the use of integer manipulative improve the poor performance of form one pupils' addition and subtraction of integers?

## **SIGNIFICANCE OF THE STUDY**

This research will outline the fundamental factors that impede the performance of JHS one pupils in solving problems of integers. It is also hoped that the results of the study would also serve as a guide strategy for teaching mathematics and for that matter integers to create a conducive atmosphere during the instructional periods as well.

## **DELIMITATIONS OF THE STUDY**

To ensure the validation and reliability of this research carried out, the researcher limited the study to JHS in the central constituency of the Tamale metropolis of Northern Ghana. The conclusion and generalizations of this research are therefore not applicable to all pupils in Zogbeli Block “B” JHS but specifically JHS one pupils. And also it applies to the topic in question and not all or any other topic in mathematics.

## **LIMITATIONS OF THE STUDY**

Every human endeavor has difficulties both weaknesses and strengths. The researcher is likely to face some challenges and confrontations which could in one way or the other affect the findings of the research which he could have little or no control over. These are   as follows;

1. Firstly, the major challenge the researcher is likely to face is a time factor. Alongside the study, the researcher needs maximum time for the daily preparation of lesson notes. Research instruments such as tests and interviews which the researcher uses all time-bound.

2. Secondly, financial problems may be a limiting factor to the success of the research. The researcher will be financially inadequate to obtain sufficient information for the study through the interest in research for related literature to the work and also the printing of the various chapters and the final work as well.  This can affect the reliability and validity of the research work.

3. Lastly, another problem of the research will be how to gather reliable data. The researcher in all honesty doubts the extent to which the data collected shall point out the actual picture of the class performance in integers in Zogbeli JHS. This is so because it is acknowledged that most of the respondents will not willing to give accurate information to the researcher on interview questions and some pupils may be absent from school and hence may not participate in the test.

## **ORGANISATION OF THE REST OF THE STUDY**

This study has been divided into five chapters. Chapter one deals with the introduction which talks about the background to the study, statement of the problem, the purpose of the study, research questions, significance of the study, limitation, delimitation, and organization of the study.

Chapter two (2) consist of a review of related literature; this entails scholars' view or finding on the research work.

Chapter three (3) deals with the research methodology, the research design, population and sample selection, research instrument used, intervention strategies, and data analysis plan.

Chapter four (4) included the results findings and discussions, while the fifth chapter is dealing with the summary, conclusion, and recommendation of the study.

# **CHAPTER TWO**

## **REVIEW OF RELATED LITERATURE**

This chapter will include what other researchers have been able to find out about students' poor performance in addition and subtraction of integers. This review is in the following sections; integers as a concept, addition, and subtraction of integers, integers manipulative, the causes, and effects, a solution to the problem, and a summary of the chapter.

## **INTEGERS AS A CONCEPT**

Integers are both positive and negative whole numbers that do not include fractions or decimals. For example; 21,11,4,-5,-17,0 are all integers. 9.5, 2/5, are not integers. The number system including both zero and the natural numbers is called the whole number system and all whole numbers are integers. Every counting number has a negative together with whole numbers, the negative comprises the remaining half of the set of integers for example; - - - -5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5, - - - note that negative integers are placed on the right side.

## **ADDITION AND SUBTRACTION OF INTEGERS**

There are a few rules to keep in mind when adding and subtracting integer Shaun (2018). We need to be very careful with our negatives.

• Positive + positive = positive

• Positive + negative = turns to subtraction

• Negative + negative = negative

For example;

6 + 12 = 18, positives add in the usual way

-3 + (-15) = -18, just add the 3 + 15 and keep the negative sign.

4 + (- 16) = - 12, different signs imply subtraction and to do subtraction simply rewrite the problem as addition. (A – B = A + (- B) ) and do not forget that in mathematics, two negatives make a positive. In other words – (- A) = A for instance, - 7 – (-8) = - 7 + 8 = 1.

It helps to think in terms of money, positive numbers are income while negative numbers are debts. Two debts added together will result in bigger debt. Income and debt will partially cancel one another out (by subtracting one from the other).

## **INTEGER MANIPULATIVE**

Integers manipulatives are objects which are designed to help the learners perceive the concept of integers by manipulating them. Brine(1966) suggests that for a learner to develop images and operations for abstract mathematical ideas, they need to develop an appreciation of mathematical ideas through concrete construction, form a perceptual image of the mathematical ideas in terms of the constructed form, and develop notation to describe the construction. Examples of such manipulatives are colored counters, number line charge particles integer chips, and so on. Some integers manipulative are isomorphic and are designed to model a similar set of binary operations other manipulatives model a different set of operations.

**CAUSES OF POOR PERFORMANCE IN ADDITION AND SUBTRACTION OF INTEGERS**

It is commonly noted that students often experience difficulty when dealing with positive and negative numbers which often leads to students not fully understanding how to deal with integers as we have negative and positive integers.

Hayes and Stacy(1998) found that some students hold fundamental misunderstandings about the operation of integers such as the following;

o – 5 + 6 = 11

o – 7 – 3 = 4

In these two cases, the student disregards the negative sign. Such a finding further reveals that negative integers are difficult to teach, hence most students experience learning difficulties starting with subtracting a larger number from a smaller number because learners think they cannot take away what they do not have.

Stephan & Akyuz (2012) studied the history and development of integers by earlier mathematics and declare that “students have similar difficulties such as concepts in particularly the meaning for the opposite of negative integer being positive number”.

Vlasis (2001) suggest that students should be able to master the addition of integers before moving on to the subtraction of integers. And to understand the signs attach to the integers for instance; +3, +5, -2, and -4 before working on them. As some students do not focus on the sign before adding and subtracting integers

## **EFFECTS OF POOR PERFORMANCE IN ADDING AND SUBTRACTING OF INTEGERS**

Vlasis (2001) indicated that student’s misconceptions about integers cause difficulties in algebra and can affect negatively the process of learning some important algebraic concepts such as algebraic expression and equations, as understanding integers are important subject material from the point of view that, it brings together the reality of positive and negative numbers in real-life contexts. Also, the poor performance of students in adding and subtracting integers would affect the students as they would require the use of integers in other subjects and real-life situations.

## **SOLUTIONS TO THE POOR PERFORMANCE IN ADDING AND SUBTRACTING OF INTEGERS USING INTEGER MANIPULATIVE**

Since students find it difficult to add and subtract integers, many mathematicians have derived methods on how to improve the teaching and learning of mathematics.

According to McCarty & Warrior (2011) the activity is a marriage between the teacher and a child-centered approach to teaching. This activity method implies the realization that children learn best by the activity involved in a lesson. This was supported by Farrant (2002) when he said “children learn most by doing” and because manipulative is so hands-on, they allow students to see and feel the numbers, which always seem to stick with them better.

According to Adjei (2001) “integers are set of numbers which consist of positive and negative whole numbers” he further explained that with the knowledge of whole numbers, numbers can be matched with the number line as shown below.

     Also, Edward (2004) say "integers are positive and negative numbers including zero" they again added that negative numbers are always written with a negative sign (-) and positive numbers can be written with a (+)sign. They further stated that as operations on whole numbers began, there were situations one has to give out more than one had. This could lead to taking from someone else which you have to replace. To represent what you need to have and have to take from somebody the symbol called negative (-) is used. What they mean is that, say to take more money than what you have in your bank account, it means you have a negative balance once you owe the bank.

## **SUMMARY OF THE LITERATURE REVIEW**

From the above literature used, it can be said that cause of pupils' inability to add and subtract integers is the misunderstanding students have about the operation of direct numbers. Also, students fail to understand the meaning of the opposite of a negative number being a positive number, students sometimes don’t master adding integers before moving to subtraction.

Also, when students perform poorly in adding and subtraction integers affect negatively the process of learning some important algebraic expression and equation concepts.

Lastly, it is a fact that students learn best by doing brought the knowledge, the view of past researchers employed manipulative to improve students' poor performance in adding and subtraction of integers. The researcher believes that there is a coherence between this work and past research on how to use manipulatives to help students in adding and subtracting integers.

# **CHAPTER THREE**

## **Methodology**

## **Overview**

This chapter explains the research design in data collection of the study, the various components of this chapter are; research design, population for the study, target population, accessible population, sample, sampling procedure data collection procedure, and data analysis.

## **Research design**

The design used by the researcher in this study is action research since the research was focused on the school system and the intention concerned with finding a direct solution to the difficulties in the addition and subtraction of integers. The aim is to improve upon practice within one or few classrooms, it is the approach that aims to improve a problem-related situation through change. This assists Zogbeli junior high school form one students to discover the concept of adding and subtracting integers using manipulatives to solve such problems, the researcher also considered this design over others because it solves the immediate problem in the classroom situation. It also encourages the full-time participation of all individuals in the classroom. It also enables both participants to develop appropriate interventions and strategies aimed at finding problems identified in the teaching and learning situations, again action research helps the researcher to collaboratively work with other people such as parents and other relatives to solve problems. Hence, it adds to the existing knowledge of the researcher. However, the weakness of this design is that itis time consuming and it does not help in arriving at a holistic situation to the immediate problem since the sample is limited to only junior high school 1 students in the Zogbeli community. Another problem is the pupils' understudy may pretend to behave in a way that may not show their actual character. Action research may not solve the target problem once it can lead to the identification of another problem. More so, it deals with classroom-related problems and it is conducted in a local setting hence the finding in one classroom cannot be applied to another class.

## **Population**

According to the Cambridge University (1998) population is defined as “all of the people living in a particular country or a place”. The study population was made up of all the teachers and students of Zogbeli junior high school in the Tamale metropolis, the school is made up of 300 students 100 female and 200 males, and the teachers are 26 males 20 and females 6 . the population that was available for the research comprised of 37% of the population of interest of which comprise of 6 male teachers and 4 female teachers, and 50 students. The gender distribution of the students was 70% male and 30% female.

## **Sample and sampling procedure**

The Cambridge University (1998) defines sampling as “a small amount of something that shows you what the rest is or should be like”. The researcher used a simple purposive sampling technique to choose Zogbeli junior high school form one students because they show peculiarity in the problem of adding and subtracting integers and with a sample size of 50 pupils which is made up of 17% of the total population of the school.

## **Data collection instrument**

Researcher in his attempted to carry out this study several of instruments were used in the study, they include the following; interviews and tests.

The interview was one of the instruments that the researcher used to collect his data for his study.  It is a tool used to gather information using one-to-one dialogue between the interviewer and the interviewee, such dialogue with the students may be structured or unstructured. By talking to them informally, students may be engaged to be interviewed before, after school, or during the break. Given this, the researcher, therefore, employed this too to enable him to acquire the desired data for this study.

The test was also one of the tools that the researcher used to collect his data for this study, according to Cronbach (1970) “a test is a systematic procedure for observing the behavior and describing it with the aid of numerical scale or fixed categories”. It is a planned attempt through a set of questions either given verbally or in written form to a learner to determine his or her performance in relation to certain skills, attitudes, and competencies. This, therefore, prompted the researcher to use this tool as not only cogent but also the easiest to collect data.

## **Data collection procedure**

In action research, data or information is collected through the intervention process, there are three intervention processes; pre-intervention, intervention, and post-intervention.

### **Intervention process**

This aspect focus on what the researcher took before, during, and after to find the solution to the problem at hand.

### **Pre-intervention**

The researcher when through a series of events such as testing and interviewing the students to find out the reasons for pupils' inability to answer questions based on adding and subtracting integers. A test was conducted with the help of my mentor Mr. Abukari, the assistant headmaster of the school. At the time of conducting the test, all the students were present for the study with an allocated time of fifteen minutes and five questions. after this, the pupils' performance was very low, the researcher interviewed the pupils on the reason why they couldn’t answer the questions correctly on the test.

### **Intervention**

This is a set of strategies planned and carried out to solve a problem or improve upon practice in a problem situation. After identifying the problem, the researcher involved himself in the situation to prevent the problem from getting out of hand. The researcher realized that the use of inappropriate methods of teaching during the teaching and learning process contributed to the difficulties in Zogbeli junior high school 1 faced in adding and subtracting integers. He intervened with some manipulatives of integers and the activity method was adopted in collaboration with the child-centered approach by the researcher.

First of all, we don’t just get up and start adding and subtracting integers anyhow, there are some rules that we must keep in mind before adding and subtracting integers which the researcher took the students through before using the manipulatives for better understanding.

Below are the rules;

1. Positive (+) + positive (+) = positive.
2. Negative (-) + negative (-) = negative.
3. Positive (+) + negative (-) = turns into a subtraction.

The researcher drilled the pupils with these rules for some time before introducing the manipulatives, the researcher used two(2) manipulatives in the lesson with charged particles and a number line. These activities are illustrated below,

#### **Using the number line**

The number line is effectively used when the various signs are identified after equal division and labeled as indicated below.

(-) means turn left

(+) means turn right

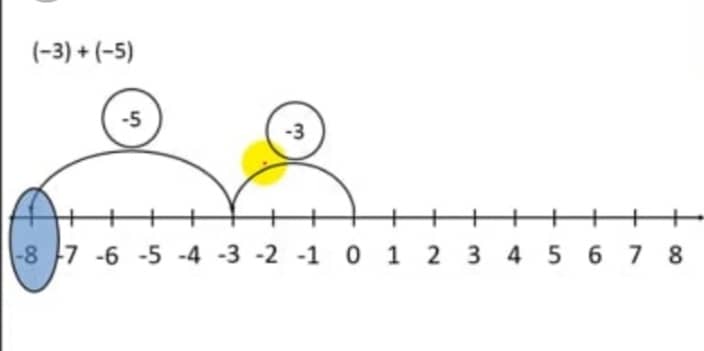
-  means move backward

+  means move forward

##### **Activity one**

Model, (-3) + (-5)

The researcher guides the pupils to draw and label the number line on the chalkboard as shown below



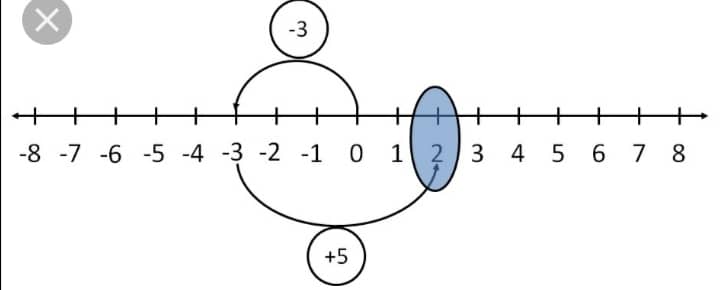
First, take (-3), pupils stood at zero and turned left, and made 3 steps to land on (-3). Note: we are turning left because of the negative sign attached to 3.

Check the sign which is (+), pupils then turned and faced right and they are turning right because of the positive sign, the next is (-5), pupils moved backward 5 steps to land on (-8). We moved backward because of the negative sign attached to 5. Pupils now understand that (-3) + (-5) = -8 which explained the rule; negative + negative = negative.

##### **Activity two**

Model (-3) + (+5)

The research guides the students to draw and label the number line on the board.



First, take (-3)

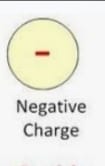
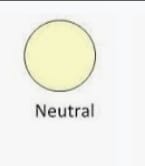
The researcher let the students stand at zero and face left and make three steps to land on -3, they then check the sign which + pupils turn and face right next is (+5) and move five steps t land on 2. they move forward because of the positive sign attached to 5.

The student realized that -3 + 5 = 2. The researcher makes sure that the students practice this activity to get the concept of adding and subtracting integers using the number line as a manipulative.

1. Using charge particles

In using charge particles as a manipulative to help students understand addition and subtraction of integers, we have to first understand the following;

Positive negative Neutral

Note that the neutral gives us zero (0)

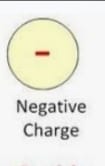
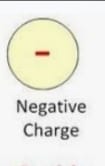
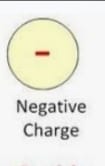
Activity one

Model: 5 + (-3)

The researcher guides the students to model five positive charged particles as

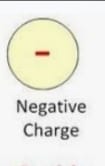
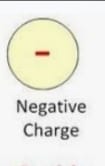
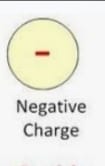
    

Secondly, he guides the students to model three negative charged particles as

Now, since we are adding the positive to the negative charged particles together, the researcher guides the students to match each negative to a positive charged as

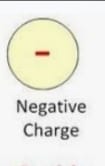
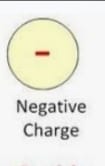
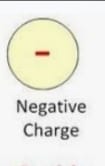
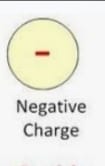
 



The students realized that, there will be 3 negative charged particles will council out 3 of the positive charged particles leaving 2 positive charged particles which indicate that 5 + (-3) = 2.

Model: - 4 + 2

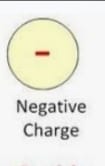
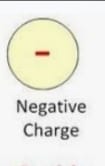
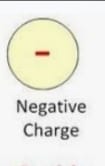
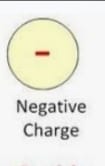
The researcher guides the students to model four negative charged particles as



The researcher then guides them to model two positive charged particles as



Now sine we are adding the positive to the negative charged particles together, the researcher helps the students to match each positive to the negative charged particles as





The students realized that, there will be 2 negative charged particles will council out 2 of the positive charged particles leaving 2 negative charged particles which indicate that (- 4) + 2 = (-2)

The researcher was highly delighted with the above activities because they made the students very happy and aroused their interest in the lesson which was activated with the use of manipulatives used.

### **Post-intervention**

After the intervention, a test was conducted to assess the product of the action taken, the student's performance showed that a great number of the students in the class understood the concept and were able to overcome their challenges in the understanding the concept of addition and subtraction of integers in mathematics. Importantly, students developed a highly positive attitude towards mathematics, and also learning concepts in abstract was entirely cleared out of their minds.

## **Data analysis**

It is essential for the data collected to be analyzed about some techniques and simple methods in collecting information. The method used by the researcher to collect his data are interviews and tests, he used the interview to gather information from teachers and students about the problem of form one student's inability to add and subtract integers in mathematics. The test in the classroom was not left out the researcher tested the students to find out their understanding level of adding and subtraction of integers.

The information received from the respondents was represented as data and analyzed through tables and percentages in chapter four (4).

# **CHAPTER FOUR**

# **RESULTS AND DISCUSSIONS**

This chapter focus on the results and discussion of the research. The various components of the chapter include the following; socio-demography of the respondents, age of respondents, and research questions.

The researcher used the teacher made-test to find out the following; causes of pupils' poor performance in addition and subtraction of integers in Zogbeli junior high school.

Details of the test results are found in the table below, which represent the scores obtained in the pre-test and post-test of the sampled group.

|  |  |  |
| --- | --- | --- |
| Score out of 5 | Number of students | Percentage% |
| 0 | 10 | 20 |
| 1 | 15 | 30 |
| 2 | 5 | 10 |
| 3 | 7 | 14 |
| 4 | 9 | 18 |
| 5 | 4 | 8 |
|  | Total = 50 | Total = 100% |

Source: Field data, 2021

The results of the pre-test in the table above revealed that out of 50 students of form one students of Zogbeli junior high school, 30 students had a score below the pass marks which is 3. It represents 60%  whiles 20 students had a pass mark of 3 and above which represents 40%.

From the pre-test results, it is very clear that a lot of the students fell below a pass mark of 3 indicating very poor performance.

After the students were taken through the intervention, a post-test was given using the same test items. The results are shown in the table below.

|  |  |  |
| --- | --- | --- |
| Score out of 5 | Number of students | Percentage% |
| 0 | 2 | 4 |
| 1 | 6 | 12 |
| 2 | 5 | 10 |
| 3 | 15 | 30 |
| 4 | 12 | 24 |
| 5 | 10 | 20 |
|  | Total = 50 | Total = 100% |

Source: Field data, 2021

The results of the post-test in the above table revealed that out of the sample of 50 students 37 of them passed representing 74%  and 13 of the students failed representing 26% which shows that there had been an improvement in the student’s performance in the post-test since the majority of them passed.

After the intervention, there was the need for the researcher to find out the extent to which the students had understood the concept, the use of the test conducted after the intervention helped the researcher to deduced from the student’s scores that, there was an improvement in the student's knowledge and skills on the topic “addition and subtraction of integers” therefore, the test as an instrument was beneficial to the researcher in his research.

## **Socio-Demographic characteristics of respondents**

These are the general characteristics of the respondent in form one that the researcher got contacted during the process of the research and they include;

### **Age of respondents**

The age range of the student in Zogbeli junior high school that the researcher got contacted with is from the age of 13year old to 16years old.

### **Sex of respondents**

This is the sex of the form one students in Zogbeli junior high school that the researcher got contacted with during his research findings of a sample size of 50 students. The researcher found out that 35 of the student were males representing 70% and 15 were females also representing 30% out of the 50 students.

## **Answers to research questions**

### **Question 1.**

1. Students attitudes towards mathematics
2. Inadequate teaching and learning materials (TLMs)

### **Question 2.**

1. It makes it difficult for students to perform well in certain mathematics topics like linear equations and algebra etc.
2. It makes it hard for the students to perform well in other subjects like integrated science

### **Question 3**

Integer manipulatives have proven to have increased the performance of form one students in Zogbeli junior high school since most of the students did not perform well during the pre-intervention stage and however got improved in the post-intervention stage.

This shows that the use of the integer manipulatives had helped the student to understand the concept.

## **Conclusion**

In conclusion, the researcher finally achieved his objective of improving the understanding of form one students in zogbeli junior high school ability to add and subtract integers which further improved their understanding of mathematics.

# **CHAPTER FIVE**

This chapter represent the summary, conclusion, recommendations and suggestion for further research on the topic.

## **Summary**

The study became necessary when the researcher in his two weeks of observation revealed that most of the students in form one of Zogbeli junior high school find it difficult to add and subtract integers. So the aim of the research was to investigate the possible cause of the problem with the view of coming out with a solution for it.

To start with, related literature was reviewed to find out what had been done in this area and also familiarize the research topic with the existing theories and findings from empirical studies.

The teacher made-test was the main instrument used for the data collection. Data related to the best way of overcoming the problem was gathered from the students.

## **Key findings**

These are the key things that the researcher found during the process of the research work, he found out that most of the students are having negative attitudes toward mathematics that lead to their inability to add and subtract integers.

In the researcher’s quest to find a solution for this problem, he realized that with the right motivation from teachers and with the use of adequate TLMs the students could over their problem of inability to add and subtract integers.

## **Conclusion**

The conclusion drawn from the study is that even though the student's negative attitudes toward mathematics and the lack of adequate teaching and learning materials (TLMs) could lead to the difficulty in addition and subtraction of integers, however, this problem can still be solved. With the section and use of adequate TLMs, and the right motivation the problem could be solved. And finally, teachers should have a good relationship with their students, so that they can approach them to clarify any challenge that they are facing.

## **Recommendations**

Based on the study, the researcher came out with the following recommendations in order to help policymakers, teachers, and future researchers.

1. Future researchers in this area should try to involve other teachers in the research process for more experience to be shared so that better results can be achieved
2. School authorities should assist to acquire adequate TLMs so that teaching will be more interesting and fun.
3. This work is recommended to all mathematics teachers who wish to help students overcome their challenges in adding and subtracting integers.

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