BINDURA UNIVERSITY

FACULTY OF SCIENCE EDUCATION

DEPARTMENT OF CURRICULUM STUDIES

KNOWLEDGE ATTITUDES AND PERCEPTIONS IN THE TEACHING AND LEARNING OF DIRECTED NUMBERS AT SECONDARY SCHOOL. A CASE IN MUDZI DISTRICT.

A RESEARCH

BY

LINAH CHISENYE

B225503B

A DISSERTATION SUBMITTED TO THE BINDURA UNIVERSITY OF SCIENCE EDUCATION IN PARTIAL FULFILMENT OF THE REQUIREMENTS OF THE HONORS BACHELOR OF SCIENCE DEDUCATION IN MATHEMATICS.

SUPERVISOR: DOCTOR L. MUKAVHI

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APPROVAL FORM

The undersigned certify that they read and recommend to Bindura University of Science Education for acceptance of research project titled**. Knowledge Attitudes and Perceptions in the Teaching and Learning of Directed Numbers at Secondary School Level. A Case of Mudzi District by Chisenye Linah** in partial fulfilment of the requirements of Honors Bachelor of Science Education in Mathematics.

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I certify to the best of my knowledge that the required procedures have been followed and the preparation criteria have been met for this dissertation.

Name(Chairperson) Dr. Z. Ndemo

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(Signature of the Chairman) (Date)

RELEASE FORM

Name of the student: Chisenye Linah

Registration Number: B225503B

Dissertation Title: Knowledge Attitudes and Perceptions in the Teaching and Learning of Directed Numbers at Secondary School Level. A Case of Mudzi District

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Signed……..Date……/……..../……..

Permanent Address

Muzezuru Secondary School

P.O. Box 24

Mudzi

Email Address: linahchisenye@gmail.com

Cell number: 0779946212

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DEDICATION

This research is dedicated to my family members who gave me some unconditional love and support throughout the programme.

DECLARATION

I Chisenye Linah, student registration number B225503B, hereby declare that the work presented here is entirely original with the exception of the citations that I have made and that l have not submitted it to any university for the purpose of receiving degree

Signed……

Date……

ABBREVIATIONS AND ACRONYMS

KAP------ ---------Knowledge attitudes and perceptions

Fig-------- ---------figure

HBScEdMt--------Honors Bachelor of Science Education in Mathematics

ABSTRACT

The study focused on knowledge attitude and perceptions on the teaching and learning of directed numbers. The research was a case study of Muzezuru Secondary School in Mudzi District in Mashonaland East. The study adopted the descriptive research design which affords the researcher the chance to use questionnaires, interviews and tests for data collection. The targeted population are Mathematics teachers and form three learners all from Muzezuru Secondary School. The sample group which was assessed through the random sampling technique consisted of thirty form three learners. The collected data were presented through the use of frequency tables, bar charts, pie chart and stem and leaf diagram. Learners seemed obsessed with positive numbers and addition or subtraction operation involving negative numbers. It was discovered that inappropriate teaching methods, teacher's attitude in some cases, pupil's attitudes towards directed numbers and inadequate teaching and learning materials were also contributing for pupil's lack of understanding of directed numbers. The study recommends that building conceptual understanding on directed numbers and operation on them must be encouraged through use of different teaching methods and teaching media and that directed numbers should be introduced at primary level.

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1 CHAPTER ONE: INTRODUCTION AND BACKGROUND

1.0 Introduction

Directed numbers are critical mathematical object in Mathematics Education as they play a fundamental role in both numerical and algebraic operation. Knowledge attitude and perception studies aim to examine the relationships and interrelations between knowledge, attitudes and perception in order to provide a comprehensive picture of people's belief and actions within a particular setting. Studying knowledge, attitudes, and perceptions (KAP) in the context of teaching directed numbers can provide valuable insights into how learners understand and engage with this mathematical concept. KAP research can help identify areas where learners may lack the necessary knowledge or understanding of directed numbers. By assessing their existing knowledge, researcher can tailor instruction to address these gaps and provide targeted support. This chapter explicated background of the study, statement of the problem, research questions, significance of the study, delimitations of the study, limitation, definition of terms and summary.

1.1 BACKGROUND OF THE STUDY

KAP studies have been carried out to address a number of social problems. KAP study is helpful in education and health sector. A KAP study's objectives in education is to assess and understand knowledge, attitudes and perceptions of individuals or groups related to a specific educational topic. The study aimed to gather information about what learners and teachers know, how they feel and what they believe about directed number at secondary school level a case in Mudzi District.

1.2 STATEMENT OF THE PROBLEM

There is knowledge in the concepts of numbers between primary school teachers and secondary school teachers. Learners and teachers regard a topic on directed numbers as difficult. They do not have perfect KAP on directed numbers. So this study seeks to explore KAP on directed numbers at secondary school level. Some learners hold basic imperative misunderstanding on operations on directed numbers as indicated below

(i) -2 + 5 = 7

(ii) -5 - 1 = 6

(iii) -2 x 5 = 10

From the above the learners totally disregard the negative signs. These results shows that directed numbers are challenging to teach. Therefore, learners face problems starting with subtracting a large number from a smaller number because learners think they cannot take away what they do not have. Thus, with the above regards, it is necessary to study on knowledge attitude and perceptions on the teaching and learning of directed numbers at secondary school level.

1.3 RESEARCH QUESTIONS

This study was guided by the following questions

1. What are the knowledge attitude and perceptions on the teaching and learning of directed numbers at Form 3?
2. Why are the negative attitude and perceptions on the teaching and learning of directed numbers at Form 3?
3. How can KAP on the teaching and learning of directed numbers at Form 3 be addressed?

1.4 SIGNIFICANCE OF THE STUDY.

Directed numbers as a major topic in mathematics contains all aspects of human life, it is unquestionably significant in education to benefit learners and all people from all walks of life to perform daily tasks efficiently and become useful, well informed, functional, independent individuals and members of the community where mathematics is important component. The beneficiaries of the study include the learners, teachers and the researcher.

1.4.1 **Learners**

A study on KAP on teaching and learning of directed numbers can benefit learners by addressing misconceptions, by enhancing their awareness, improving learning materials, improving learning methods and fostering motivation. By understanding learner's preferences and attitudes researchers can tailor their instructional approaches to better meet learners' needs. This can lead to the development of more effective learning strategies that align with learner's preferences. By identifying these misconceptions and misunderstanding, learners can correct their understanding and develop a more accurate conceptual framework.

1.4.2 **Researcher**

The research expands on the existing body of knowledge in the field of mathematics education by examining the particular subject of directed number learning and teaching. It provides the researcher with a deeper understanding of learners' attitudes and perceptions in this domain contributing to the overall knowledge base of mathematics education research. The researcher benefited from the research as it helped her to make sure that the area under study was made clear to them so that they would be equipped to deal with the challenges related to the study area. This means that by partaking in this study, the researcher gained research skills that are useful and lifelong. Also, the researcher was able to make suggestions in the studied area so that there is a clear way that those who read this study benefit too.

1.4.3 **The teachers**

The teachers benefited from this study as they were able to use the results of this study. This means that the study enlightened the teachers so that when they go back to practical exercise in their profession, they would be able to better their skills and ways of managing their classes when teaching directed numbers. This study also highlights the effectiveness of using different teaching methods and ways of motivating learners and this information was an eye opener to the teachers who would have been vigilant when handling learners such that they created positive attitude and perceptions on the study of directed numbers.

1.5 Delimitation

Delimitations are restrictions that researchers impose on their research in the study on the Knowledge, Attitudes, and Perceptions (KAP) of learning and teaching directed numbers. The study focused on a specific geographic region that is Muzezuru Secondary School in Mudzi district Mashonaland East Zimbabwe. By narrowing the scope geographically, researchers can gain a deeper understanding of the KAP related to directed numbers within that specific context. The study targeted a specific form level such as Form three. This delimitation allowed researchers to explore the KAP of directed numbers within a particular developmental stage or educational level.

The study focused on Form 3 learners and teachers of Muzezuru Secondary school. By targeting a specific group, researchers can gain insights into the KAP of directed numbers from their perspective and examine any variations or similarities among different participant

groups. The study employed some specific research methods, such as, interviews, or observations. The study was conducted in a specific language or languages, limiting the inclusion of participants who are proficient in those languages. This delimitation allows researchers to focus on specific linguistic and cultural contexts related to directed numbers

1.6. Limitations

The program of HBScEd in Mathematics has specified time to carry out the research that is from early March to 3o June 2024.However, the researcher maximized the time allocated to carry out the study by the University. Also, the money to buy data, material and for transport to visit the supervisor and the District office was a challenge. The researcher visited areas with strong network like Bindura University and bought private wiffi and sacrificed to meet all the cost.

1.7 Definition of terms

1.7.1 **Directed Numbers**

According to n.a (https://operationmaths.com), directed numbers are numbers with both size and direction, one direction is positive and the other is negative .For instance, temperature is commonly expressed as a number in degrees, either positive or negative, above or below zero.

1.7.2 **Algebra**

According to n.a (https://www.cuemaths.com), algebra is a branch of mathematics that uses both letters and number to show the relationships between quantities. Quantities are denoted using negative and positive numbers.

1.7.3 **Knowledge**

According to Bates (2018), knowledge is the information given meaning and integrated with other contents of understanding. As a result, knowledge is a comprehension of facts and abilities gained by education, training, study or observation.

1.7. 4 **Attitude**

According to Brown, (2018), attitude is defined as a personal conviction that mirrors an individual's thoughts and emotions and may occasionally materialize in action. Therefore,

attitude refers to a person's mental and emotional outlook towards something or someone. Attitudes can be positive, negative or neutral, and they can influence how people perceive or interact with the world around them. Attitude can influence decision making, motivation and how individuals respond to challenges or opportunities. For example, positive attitude towards learning of directed numbers can drive a person to seek knowledge and acquire new skills, while a negative attitude can hinder growth and development.

1.7.5 **Knowledge Attitude and Perceptions**

According to Brown (2018), Knowledge Attitudes and Perceptions (KAP) refer to three interrelated components that are often studied together to gain a compressive understanding of a particular topic and sets using numbers and symbols.

Learning: is the process of gaining knowledge and experience for example, studying.

1.8 Chapter Summary

This chapter covered the background of the study, statement of the problem, research questions, and significance of the study, delimitation, limitations and definition of important terms. The chapter unlocks a piece of research involving knowledge attitude and perceptions in the teaching and learning of directed numbers on a secondary school level a case, of Mudzi district. The next chapter looked at the literature review

2 CHAPTER TWO: LITERATURE REVIEW

2.1 INTRODUCTION

This chapter reviews knowledge attitude and perceptions on the teaching and learning of directed numbers. According to ed.ac.uk/institute-arcade, literature review is a piece of academic writing, demonstrating knowledge and understanding of the academic literature on a specific topic placed in context.

2.2 KNOWLEDGE ATTITUDE AND PERCEPTION

According to Brown (2018), knowledge attitudes and perceptions (KAP) refer to three interrelated components that are often studied together to gain a compressive understanding of a particular topic. KAP studies aim to examine the relationships and interrelations between knowledge, attitudes and perceptions to gain a holistic understanding of individual views and manners in a given context. Studying knowledge, attitudes, and perceptions (KAP) in the context of teaching directed numbers can provide valuable insights into how learners understand and engage through this mathematical concept. Therefore, are those manners about one`s perceptions. Perceptions are ways of viewing things. There are categories of these attitudes which are mainly positive and negative attitudes.

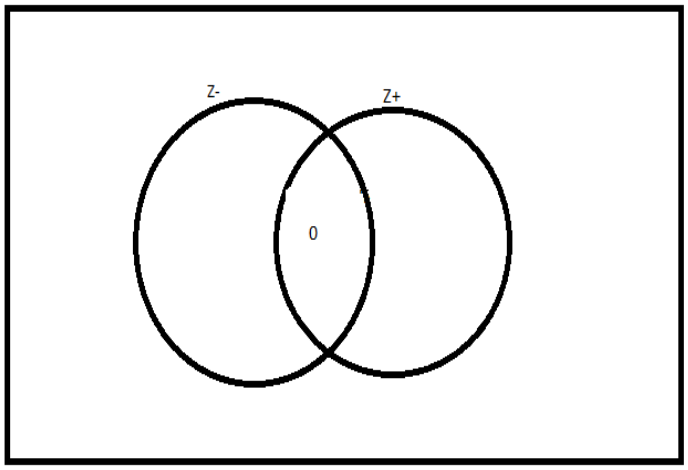
2.3 CONCEPTUAL FRAMEWORK

A conceptual framework is a structure that serves as a basis for comprehending and evaluating a certain issue. It is made up of a number of related ideas, concepts, guiding principles and variables. It consists of a set of interconnected concepts, theories, principles and variables that guide the research. When it comes to directed numbers, a conceptual framework can provide a theoretical structure for understanding and working with these numbers. Positive numbers and negative integers, as well as zero, are examples of directed numbers. They represent quantities that have both magnitude and direction.

According to Pillai (2020), conceptual framework for directed numbers may include positive numbers, negative numbers, zero, and the operations performed on these numbers (such as addition, subtraction, multiplication, and division. A number line is a visual representation often used to illustrate directed numbers. It provides a graphical representation of the magnitude and direction associated with each number. The framework may include rules and properties that govern the operations performed on directed numbers. These rules define how to add, subtract, multiply, and divide directed numbers, as well as the properties that hold for these operations.

The framework should include strategies for performing operations on directed numbers. These strategies may involve rules for adding and subtracting numbers with like and unlike signs, rules for multiplying and dividing numbers with different signs, and techniques for simplifying expressions involving directed numbers and also the rule of precedence. The conceptual framework can also include real-world examples and applications where directed

numbers are used. This may include scenarios involving temperature changes, elevation changes, financial transactions, and other situations where direction and magnitude play a role. The table below shows positive and negative real numbers. Positive numbers include +3, +4, +3 and negative numbers include -2, -7,-1.



2.4 THEORETICAL FRAMEWORK

According to Mandic (2020), in mathematics, theoretical framework is a collection of ideas, precepts, and presumptions that serve as the basis for comprehending and assessing a certain topic or field of study. When it comes to directed numbers, which include positive and negative integers, a theoretical framework provides a systematic way of reasoning about these numbers and their properties.

One commonly used theoretical framework for directed numbers is the number line (Pillai (2020). The number line is a visual representation of numbers where positive numbers are located to the right of zero, and negative numbers are located to the left. The position of a number on the number line indicates its magnitude and direction.

According to Pillai (2020), theoretical frameworks also include axioms and rules that govern the behaviour of directed numbers. For instance, the commutative and associative properties of addition and multiplication hold for directed numbers. Other properties, such as the distributive property, the existence of additive inverses (opposites), and the concept of absolute value, are also part of the theoretical framework.

Furthermore, theoretical frameworks may incorporate concepts from algebra, such as equations and inequalities involving directed numbers. These concepts allow us to solve problems and make comparisons involving directed numbers.

Overall, a theoretical framework provides a structured and coherent approach to studying directed numbers, enabling us to define and understand their operations, properties, and relationships. It serves as a foundation for further exploration and application of directed numbers in various mathematical and real-world contexts.

2.5 CHAPTER SUMMARY

This chapter looked at content produced by other authors and researchers in the work involving knowledge attitude and perceptions on teaching and learning directed numbers. The next chapter focused on the research design and methodology.

3 CHAPTER THREE: RESEARCH METHODOLOGY

3.1 INTRODUCTION

The chapter looks on the research design, population, sample, sampling techniques, research instruments, data collection procedures data presentation and analysis procedures in knowledge attitude and perceptions in the teaching and learning of directed numbers.

3.2 RESEARCH METHODOLOGY

According to Babbie (2019), research methodology refers to the systematic and organized approach employed by social researchers to investigate social phenomena. It involves the collection of data using different methods, interpretation of the data and reporting of findings. This research is guided by qualitative and quantitative methodology. Qualitative research is a means for exploring the understanding, the meaning that individuals or groups ascribe to a phenomenon based on discovery. Qualitative data on Knowledge Attitude and Perceptions on the teaching and learning of directed numbers were collected from the teachers and learners. Qualitative data should be collected on knowledge, attitude and perceptions on directed numbers. Quantitative research is a research methodology that focuses on collecting and analyzing numerical data to understand concepts.

3.3 RESEARCH DESIGN

Asenahabi (2019) describes research design as the plan and structure of the investigation used to obtain evidence to answer research questions. Action research is a systematic process of learning by doing and carefully observing on one's practices and improving the situation in which practices are carried. It promotes positive and social change and includes pupils learning condition.

3.4 POPULATION

Maxwell (2021) defines population as the group of interests to the researcher; the group to which the researcher would like the results of the study to be generated .Therefore, population is the total set of observations from which a sample is drawn. The population in

this study comprised of hundred form three learners of mixed abilities and two teachers from Muzezuru secondary school.

3.5 SAMPLE AND SAMPLING PROCEDURES

According to Bardzell (2019), a sample is a subset of individuals or cases selected from a large population for the purpose of research or statistical analysis. It was believed that the teachers and learners to be involved in the study had information on the study. The sample comprised of thirty form 3 learners with mixed ability were randomly chosen from the population and two male Mathematics teachers. All individuals in the sample were drawn from Muzezuru Secondary school.

3.6 SAMPLING TECHNIQUES

The random sampling method was used in the study. The respondents were selected on the basis that they were mathematics teachers and learners were in the area of the study. Two mathematics teachers were considered. For learners, the researcher cut small piece of papers to give a total of hundred and the papers were written NO and YES and were placed in a hat.70 of the papers were written NO and 30 of them were written YES. Each learner was given one chance to pick one paper from the hat and all those who picked YES were considered in the experiment.

3.7 DATA COLLECTION PROCEDURES

Pandey and Pandey (2021) describe data collection as the methods or ways in which information is gathered. The researcher talked to two teachers on the same day and briefed them on the purpose of the visit to seek their permission. The researcher distributed the questioners to two teachers and learners and the questioners were collected on the same day of distribution. Follow up interviews were conducted with two teachers who had earlier responds to the questioners. This was a bid to gather information from them as there was a room for probing. A pretest was given to the learners on the other day to check their knowledge and perception on directed numbers. The researcher marked the test, identified the errors made by the learners and recorded the test.

The researcher then conducted lesson using question and answer method, class discussion, demonstration and group work. The researcher taught the group with special treatment for the purpose of remediation. Attention was given to the learners, use of work cards, number line and textbooks were also available. The learners were given posttest on directed numbers and

the test was marked and recorded. Learners were also given questionnaires and were collected after three days and all questionnaires were returned.

3.8 ETHICAL CONSIDERATIONS

There is need for a brief on the nature and purpose of the study both to the teachers and learners involved. Also, there is need to assure that the identities would be held in the strictest confidence and that the data to be obtained from the study would be used solely for the stated purpose. Dates and time for conducting the interview was agreed on so as not to disrupt scheduled classes. The researcher acquired an introductory letter from Bindura University of Science Education. This was followed by seeking permission from the District Schools Inspector and the head to carry out the research at a school in the district. The researcher booked time with the teachers involved and this avoid disruptions to their work routine.

3.9 DATA COLLECTION INSTRUMENTS

Mkandawire (2019) describes data collection instruments as the procedures for data collection and the following are some of the instruments, questionnaires', interview observations and test. These are tools used by the researcher to help them find information.

3.9.1 Questionnaires

Questionnaires were used to collect data. According to Grey (2009), questionnaires are search tool through which people are asked to respond to some set of questions in a predetermined order. The researcher used questionnaires for mathematics teachers and learners in this study because of the following;

(i) Teachers and learners were likely to give true information, in a freeway and in privacy. The researcher had assured teachers and learners of confidentiality.

(ii) Collected information would be easily represented in the form of diagrams, graphs and tabled.

(iii)The questionnaires had its own weaknesses which include;

a. Teachers and learners need thorough monitoring since some could copy each other, thereby giving in accurate information on an individual's opinion.

b. If the questionnaires are not clear and the instructions are difficult to understand, the respondents could be confused and give wrong information.

3.9.2 Interviews

Interviews were done to probe learners and teachers of Muzezuru Secondary School on knowledge attitude and perceptions on the teaching and learning of directed numbers.

According to Kuhne (2020) the personal interview involves the interviewer reading the questions to the respondents in a face to face setting while the interview can observe verbal and non-verbal behaviour of the respondent. Secondly, unlike in a questionnaire, questions can be repeated and their meanings explained in a case they are not understood by the respondent. Thirdly the interview can also press for additional information when a response seems incomplete. Researcher used interviews because of the following;

(i) They created the opportunity to meet face to face with respondents to get in-depth information relevant to the study.

(ii) allowed many questions to be asked in one and there was a room for probing

(iii) They allowed high response rate and the method was flexible. If the questions not understood the researcher could ask in a different way.

(iv)Non-verbal responses could be noted through gestures, emotional changes and facial expressions.

Interviews have the following weaknesses noted during its conduction;

(I) It took much time to conduct interviews, hence the process was tiresome.

(ii)It was difficult to record responses; hence the researcher could miss some important points.

(iii)In some examples, respondents could be reserved to give responses to certain questions.

3.9.3 Observations

The researcher managed to use the unobtrusive observation. According to Kellehear (2020), it is a process whereby learners are observed or required to do nothing out of the ordinary. This method provides data uninfluenced by an awareness of the subjects that they are participants in a study. However, if not properly carried out, negative results may be provided because if the subjects discover that they were being observed they would take on behaviour that would be expected by the observer. Subjects may behave differently; try to validate the results by inaccurate, defensive or dishonest means, feeling were used in experiments.

3.9.4 Tests.

The researcher also designed two tests: a pre-test and post-test to compliment views given by students and teachers in the questionnaires and interviews given. The tests were given to 30 learners and contained 20 questions. The four operations which are addition, subtraction,

multiplication and division were considered in the survey. The tests have the following advantages;

(i) First-hand information on the pupils 'problems when dealing with directed numbers were noticed.

(ii) Tests would also present substantial evidence of pupils' understanding of subject matter.

(iii) The actual performance of individual learner would be identified from the test results.

(iv) The test was easy to administer.

The following weaknesses were noted during the tests;

Tests were seemed not to be reliable since the results could be affected by illness and any other discomforts during the test like social problems from home. Some pupils would not participate whole-heartedly, resulting in the researcher to obtain true problems that learners face when writing the tests.

3.10 CHAPTER SUMMARY

The researcher presents the research approach used for data collection. Random sampling technique was used to make sure the objectives of the study were achieved successfully. Confidentiality of respondents was also considered and respondents were respected and protected. The following chapter looked at data presentation and analysis.

4 CHAPTER FOUR: DATA PRESENTATION AND ANALYSIS

4.1 INTRODUCTION

The chapter focused on presentation and analysis of the data from the interviews, questionnaires, observations and tests. The data collected was presented in the form of tables and graphs.

4.2 INTERVIEW FOR TEACHERS

Two teachers were interviewed one male and the other female. Teaching experience was considered to be vital since teachers who serviced long are assumed to have conducted many lessons with different learners of different academic performance. Both teachers are of the opinion that directed numbers were a practical component of the number system that is used in everyday life. They all stated that directed numbers should be introduced in the first term of term one of form one.

One of the teachers argued that the learners got confused because of what they were taught at primary level about negative numbers which were said they do not exist and also on subtracting a bigger number from smaller number which was said it can‘t. The other teacher said that learners back him very happy when number line was used, learners were very curious to know how negative numbers works.

All teachers agreed that learners faced challenges when adding two negative numbers that is (-2+-7) or a positive number with a negative number, dividing a negative number by a negative number, multiplying a negative number by a positive number. The teachers suggested that the use of media like work cards, charts and concrete objects like the ladder helped learners to grasper concept of directed numbers.

4.3 QUESTIONNAIRES FROM TEACHERS

Table 4.1 Teacher sex, age, qualifications and teaching experiences

Teacher	Sex	Age	Qualifications	Teaching Experiences
X	Male	35	Diploma in Education Mathematics	7 years
Y	Female	29	Bachelor of Science Education Degree in Math’s	11 years

.

There were two mathematics teachers who responded to the questionnaires and interviews .Both were trained to teach mathematics. Both sexes were being represented since there was one male and one female. And this indicated that both males and females can teach mathematics. The ages were between 30 and 40 hence mature and old enough to be having much experience.

Table 4.2: Responses on perceptions of learners on the learning of directed numbers

Responses	Number of teacher
Good perceptions	2
Bad perceptions	0

The responses show that learners have good perceptions on the teaching of directed numbers although they face some challenges when dealing with directed numbers.

Table 4.3: Responses on teaching methods used by the teachers

Teaching method	Number of teachers
Group work	2
Demonstrations	2
Lecture method	0
Question and answer method	1
Pair work	2

.

Responses show that both teachers used group work, pair work and demonstrations. These are most effective methods of teaching directed numbers since they are pupil centered. During group work, learners share ideas and help each other. Learners needed to be involved in the activities so that they can get motivated and grasp the concepts.

Table 4.4: Teaching aids used by the teachers

Teaching Aids	Number of teachers
Charts	2
Work cards	2
Refrigerator	2
Thermometer	2
Flash cards	1

Responses show that teachers used media when delivering lessons on directed numbers. Charts, work cards, Thermometer and refrigerator were teaching aids which most of the teachers used so that learners may understand directed numbers better.

Causes of negative attitude and perceptions of learners towards teaching of directed numbers.

Culture in learners that mathematics is a difficult subject was one of the causes for learners to have negative attitude and perceptions on the teaching of directed numbers. Also the fact that at primary level they were taught that subtracting a bigger number from a smaller number it can't makes learners to resist that 6-10= - 4.

4.4 QUESTIONNAIRES FROM LEARNERS

The researcher managed to distributed questionnaires to 30 learners and they all managed to return them with the information required. From the thirty learners, 8 were boys and 22 were the girls since the first question required learners to indicate their sex. The next question required learners to indicate their age category and the results are as follows

Table 4.5: Frequencies of learners' age group

Age	Number of learners
12 years and below	0
13-15 years	8
Above 15 years	22

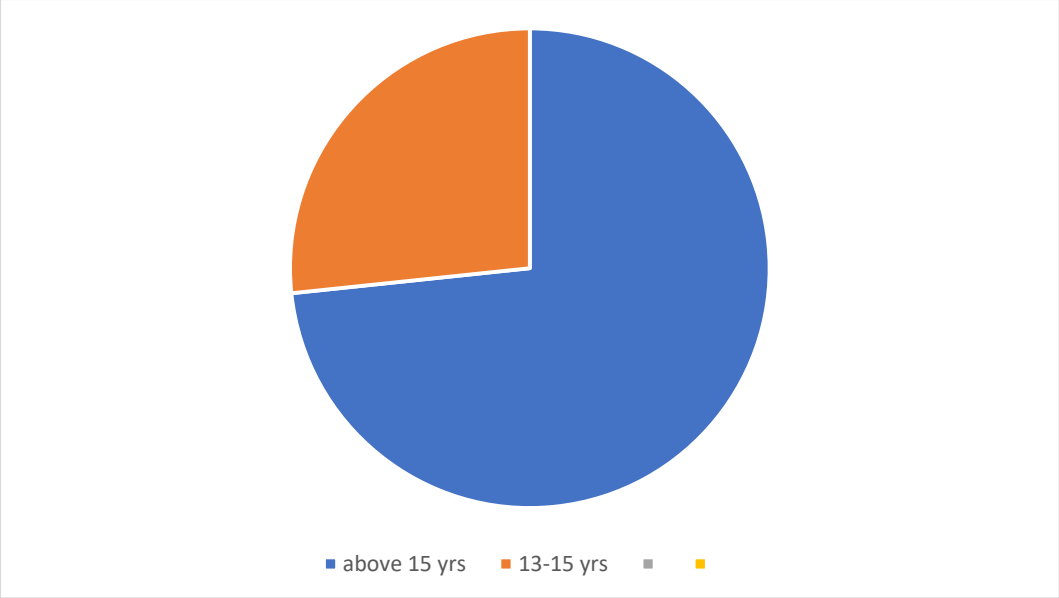


Figure 4.1: *Age of learners*

Question 3-9 had to do with challenges and enjoyment of learners, teachers and learners' attitude towards mathematics when dealing with directed numbers. The responses are displayed below

Table 4.6: Responses for question 3-9

Question	Strongly Agree(SA)	Agreed (A)	Disagree (D)	Strongly Disagree (SD)
3	0	30	67	3
4	23	47	30	0
5	30	43	27	0
6	10	73	10	7
7	54	40	3	3
8	20	44	33	3
9				

The number of students under each column is given in percentage. From question 3, the majority of learners showed that they did not understand the meaning of directed numbers. In question 4, 23 % strongly agreed and 47 % agreed enjoyed the way directed numbers were introduced. Seventy three of the learners in question six agreed that they had difficulties in learning directed numbers. However, 54 % of the learners strongly agreed and 40 % of the learners agreed in question seven showed that their teachers were confident when teaching directed numbers.

4.5 PRE -TESTS

The researcher managed to give pretest to 30 learners who were picked at random and the test was marked and recorded. The table below the marks:

Table 4.7 : Marks obtained by learners in the pre test

Range of marks	0-4	5-9	10-15	16-20
Number of learners	2	21	7	0

The information in the above frequency distribution table shows that only 7 learners managed to pass the pretest. The results showed that most learners performed badly in the pretest on the directed numbers. The marks obtained by the learners in the pre tested can be represented using a bar graph as below

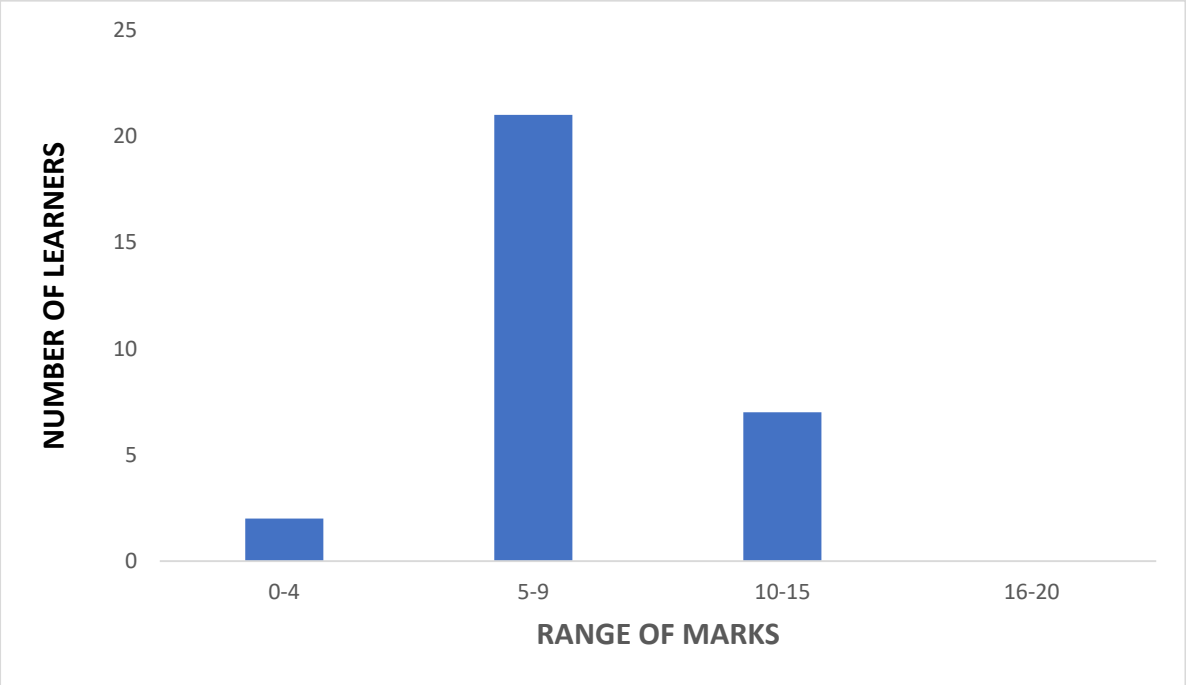


Figure 4.2 :*Marks obtained in the pre test*

From the bar graph in Figure 4.2, it is evidenced that the most learners got the marks in the range 5 to 9 since it has the tallest bar. And none scored marks in the range 16 to 20 since there is no bar. From the marks obtained from the pretest it is noted that learners has knowledge on directed numbers. However, most of the learners have difficulties on directed numbers and the difficulties were noted. The percentage of learners who passed and failed the test can be represented on a pie chart.

Percentage of pupils who passed is 23% and the percentage of pupils who failed is 77%.

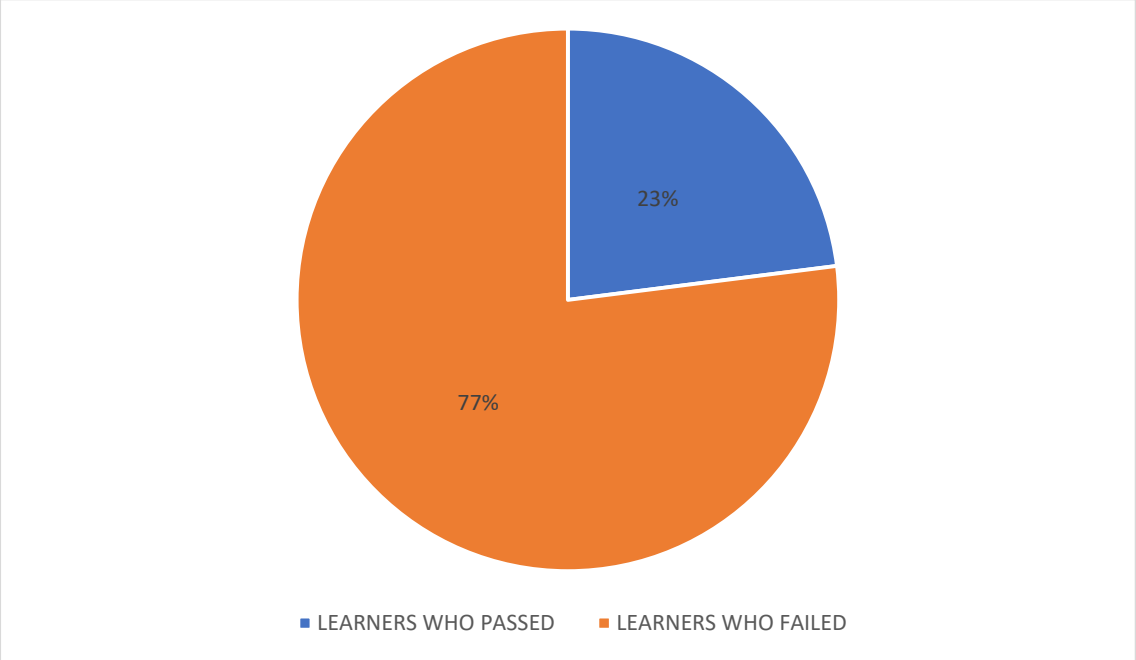


Figure 4.3: *Percentages of learners who passed and failed the pre-test*

4.6 COURSE OF ACTION

The researcher managed to conduct 4 lessons. Each lesson was 35 minutes long. The concept of directed numbers and algebraic expressions were covered in the lesson. Teaching methods employed include group work, pair work, discussions and question and answer session. During pair work and group work, learners managed to share ideas and help each other. All activities in the lessons were closely monitored by the researcher so as to assist individuals who encountered problems. Charts, work cards and number line strips were also used as media. The researcher explained that when two numbers have different signs there is need to ignore the signs then subtract the smaller number from the bigger number then on the answer to put the sign of the bigger number. Also when two numbers have same signs ignore the signs then add the two numbers then put the common sign.

4.7 OBSERVATION

The researcher made a number of observations when conducting lessons. These include lack of interest in the activities involved and fidgeting result to not listening during the lesson. Some of the learners were participating very well. Majority of learners on the pre-test were really making some errors of omitting the sign, for example -3-5=8, they got 8 instead of -8,some simplified -3 + 5 to get 8 they were failing to apply the rules for directed numbers. Others factorized when multiplying (-3) × (-4), they got – (3×4) = -12 instead of 12. However, the researcher took some corrective measures.

Initially, girls were not cooperating judging from the responses during the lesson, but the researcher tried to motivate the learners and finally some boys and girls ended up participating in the activities. Some learners were failing to understand as the teacher was teaching in English, but the teacher then use code-switching between the mother tongue and English and most of the learners started to understand

A post –test was then given to the sample group to check if there was differences in learners' performance. Questions set were different from those of the pre-test. Learners were being monitored to make sure that learners were not copying each other.

4.8 POST TEST RESULTS

Table 4.8: Marks obtained by learners in the post test.

Marks	0-4	5-9	10-15	16-20
Number of learners	0	4	20	**6**

The frequency table above shows that only 4 learners out of 30 failed the post test and the majority passed the posttest. This proved that teaching methods employed which include demonstrations, group work, pair work and teaching media which include chart with number line and a refrigerator used by the were very effective. Most of the learners have good perceptions and positive attitudes towards directed numbers .However, the few still made errors and have challenges on directed numbers. Marks obtained on the post test can be displayed on the bar chart.

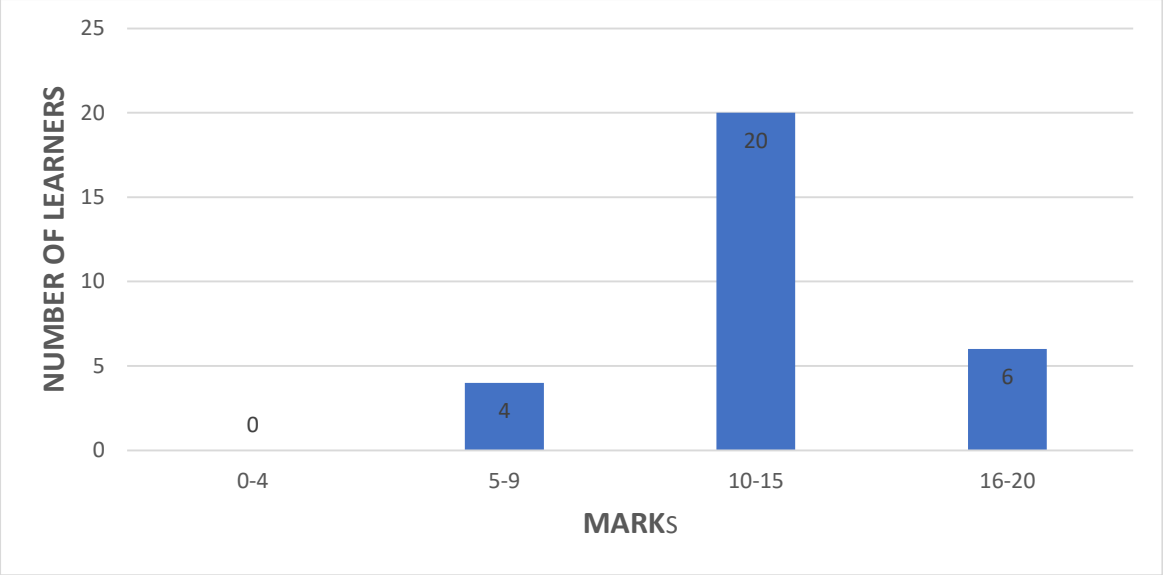


Figure 4.4: *Marks obtained by the learners in the post test.*

The bar graph above shows that most learners' scores were in the range 10 to 15 in the post test and the few fail the test. This proved that the teaching methods employed by the teachers were effective and the difficulties faced by learners were addressed though a few still faced minor challenges. The teachers were using code switching of the mother tongue and English to ensure all learners understood the concept.

Paired sample T- test to test the hypothesis that the knowledge and perceptions on the teaching and learning of directed numbers has an effect on the performance of learners.

Table 4.9: Paired sample t-test to test the hypothesis that teaching of directed numbers has an effect on the performance of learners.

Student	Pre-Test Mark(b)	Post-Test Mark (a)	d= (a-b)	d^2
1	11	14	3	9
2	4	9	5	25
3	6	11	5	25
4	15	17	2	4
5	8	11	3	9
6	9	15	6	36
7	14	20	6	36
8	6	16	10	100
9	6	14	8	64
10	9	13	4	16
11	15	15	0	0
12	9	15	6	36
13	10	14	4	16
14	14	14	0	0
15	6	14	8	64
16	4	14	10	100
17	6	8	2	4
18	5	15	10	100
19	5	10	5	25
20	9	8	-1	1
21	6	7	1	1
22	7	14	7	49
23	5	16	11	121
24	7	13	6	36
25	9	18	9	81
26	6	14	8	64
27	13	14	1	1
28	5	14	9	81
29	6	13	7	49
30	8	17	9	81
Totals			165	1234

Expectation of d =164 ÷ 30 = 5.47

95% confidence interval is given by expectation of a – expectation of b = expectation of d

Variance =11.64

Standard deviation= 3.41

5.47 +/- t 0,025 × 3.41 /square root of 30=

5.47 +/-2.045 ×3.41 /square root of 30 =

(4.20; 6.74)

Using the confidence interval, test the hypothesis that the teaching of directed numbers using media and different teaching methods have an effect on the marks scored by learners on the marks scored.

Ho: expectation of d =0 against H1: expectation of d is greater than 0

Since 0 is not an element of (4.20;6.74) , we reject Ho and accept H1 and conclude that employing different teaching methods like group work ,demonstration and pair work and using the media like work cards on teaching of directed numbers have the effect on the marks scored by learners in the post test.

Comparison of marks of pre-test and post-test are done below

Leaf (Pretest)	**Stem**	**Leaf (Posttest)**
99999887766666666555544	**0**	7889
5544310	**1**	01133344444444444555566778
	2	**0**

Key	**Key**
4/0 = 4	1/0 = 10

Figure 4.5: *Comparison of the marks of pre-test and post-test marks*

Figure 4.5 shows marks obtained in the pre-test and post- test .Better performance in the post test indicated that the treatment given to the sample group brought the differences in the

learners knowledge attitude and perceptions on directed numbers. Teaching methods employed like group work and pair work helps learners to share ideas and help each other.

4.9 CHAPTER SUMMARY

This chapter was concerned with data presentation from interviews, tests and questionnaires. The data was presented in the form of bar graphs, pie charts, frequency tables, stem and leaf diagram, tables and narrative descriptions. From the data collected there is clear indication that poor teaching methods, culture that mathematics is difficult both from family members and friends and errors they made when multiplying or dividing a negative number with a negative number or subtracting a bigger number from a smaller number stands as knowledge attitudes and perceptions on the teaching and learning of directed numbers. Negative attitude by learners towards mathematics and errors made by learners were also leads to poor performance by learners when dealing with directed numbers. The next chapter focused on summary, conclusions and recommendation to the study.

5 CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONDS

5.1 INTRODUCTION

This chapter was concerned with the summary of the study, conclusions drawn from the findings of the study from questionnaires, interviews and tests from the learners and teachers. Recommendations made benefit all interested parties in the study of knowledge attitude and perceptions on the teaching and learning of directed numbers and for future studies.

5.2 SUMMARY

The purpose of the study is on knowledge attitude and perceptions on teaching and learning of directed numbers at Muzezuru Secondary school in Mudzi District. Thirty learners from form three of mixed abilities and two mathematics teachers all from Muzezuru Secondary School were taken as subjects in this study .Random sampling was used to select learners to make sure that there was no bias . Qualitative and quantitative methods were used to collect data though questionnaire ,interviews, observations and tests .Various constraints met during the research period of the study and these could have had a negative effects to this study .Time was one of the constraints .However, besides the constraints, the research was successfully completed. Challenges in the teaching and learning of directed numbers were noted and some attempt were made in trying to come up with some solution.

5.3 FINDING OF THE STUDY

5.3.1 Challenges faced by learners when dealing with directed number

In the questionnaire, learners point out that they did not understand the meaning of directed numbers. The result of tests which involved addition, subtraction, division and multiplication with brackets especially under the introduction of negative numbers posed the greatest challenge in directed number. From the interviews, most teachers stated that the majority of learners have difficulties in subtracting a bigger number from a smaller number and in negative directed numbers. From the questionnaires for teachers, they argue that learners face challenges like language challenge. They fail to grasp the concept when the concept is being taught in English throughout. Teachers also stated that learners do a lot of errors and some face the challenge if not being intelligent, so they took time to grasp the concept and sometimes fail to grasp the concept at all. Teachers also stated that some learners have

negative attitude towards mathematics and parents do not play their roles in the education of their learners.

5.2.2. Possible cause of challenges

The researcher observed the following: Most of the teachers from their questionnaire stated that lack of use of media and concrete objects such as thermometer and ladder, premature use of calculators, poor attention by learners and use of text books with insufficient examples are some of the possible causes of challenges. Most teachers rely of established rule to solve problem in directed numbers. These rules sometimes are misapplied like the rule which says "two negative numbers gives a positive number." This is because of unclear explanation from teacher, student end up writing -2-3= or (-2) + (-4) = 6.

5.2.3. Solution to challenges faced by learners

The researcher also observed that teaching methods such as group work, class discussion, guided discovery and demonstration are some of the solution to the problems if properly applied as mention by teachers in the interviews. From questionnaire for teachers and interviews, both teachers state that use of code-switching between mother tongue and English, use of media and number line strip, using text books with many examples and delay use of calculators can be solutions to causes of challenges faced by learners when dealing with directed numbers at form three level..

5.3. Conclusion

The challenge faced by learners when dealing with directed number might have been many and varied and some of them are direct and other are indirect. However, the researcher using research tools mentioned earlier arrived to a number of conclusions which contribute to challenge faced in the teaching and learning of directed numbers and these are; inappropriate teaching methods, lack of teaching media ,lack of knowledge on part of the teacher, negative attitude of learners towards directed number, lack of teaching and learning material, premature use of calculators by learners ,poor attention on part of the learners ,failure to understand the language used especially if it's English only throughout the lesson and negative numbers pose the greatest challenges in operations involving directed numbers.\

5.4. Recommendations

● In light of the conclusions mentioned, the researcher found it worth to make following recommendations; Directed numbers should be introduced at primary level in order to allow enough time for learners to interact with directed numbers especially negative numbers.

●Teaching and learning should be readily available in schools to enhance constant practice of directed numbers

●Teachers should use code-switching both mother language and English when teaching directed numbers for learners to understand better

●Rules on directed numbers should be clearly explained by teachers to avoid misapplications.

●Those responsible for mathematics syllabus construction should ensure that topics ar**e** properly arranged in order starting with directed numbers at secondary level for learners to understand.

● Different teaching methods should be used to motivate learners. Participatory methods such as group work and guided discovery learning should be given more time and preference to accommodate the effectiveness.

●Teachers should delay learners to use calculators.

●Test and examinations should bring more questions on directed numbers which help learners to do more practice.

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APPENDIX A

Questionnaires for learners

My name is Linah Chisenye mathematics student teacher at Bindura University carrying my research on knowledge attitude and perceptions on teaching and learning of directed numbers. Below is a set of questions which l kindly requests you to answer. Information will be treated with strict confidence.

Tick where applicable

1. Sex:
Male……..Female……..

2. Age: 13-15 years……..Above 15 years……..

Use the following for questions 3-9, A = Agree, SA = Strongly Agree, D=Disagree, SD= Strongly Disagree

3. Do you understand the meaning of directed numbers?

A……SD……..D……SD……

4. Did you enjoy the way you were introduced?

A……SD……D……SD……..

5. Did you enjoy Maths after learning directed numbers?

A……SD……D……SD……

6. Did you have difficulties in learning directed numbers?

A……SD……..D……SD……
……

7. Did you teacher show confidence when teaching directed numbers?

A……SD……D……SD……..

8. Did you develop a positive attitude towards Mathematics after you teacher taught directed numbers?

A……..SD……D……SD……

APPENDIX B

Questionnaires for teachers

My name is Linah Chisenye, a Mathematics student teacher at Bindura University carrying a research on knowledge attitude and perceptions on teaching and learning of directed numbers. Below is a set of questions which l kindly request you to answer. Information will be treated with strict confidence.

Please tick the answer or fill the space provided

1. What is the knowledge attitude of learners at you school towards directed numbers?
   Positive …… Negative……
2. What are the perceptions of learners on the learning of directed numbers?
   Good……Bad……
   ……
3. What is your knowledge attitude and perceptions in the teaching of directed numbers?
   ……
   ……
   ……
   ……
4. What are the causes of attitude and perceptions of learners towards teaching of directed numbers?
   ……
   ……
   ……
   ……
   ……
   ……
5. What do you think can be done to resolve the challenges?
   ……
   ……
   ……
   ……
   ……
6. Which teaching methods do you use when teaching directed numbers?

APPENDIX C

Interviews guide for teachers

1. Sex

2. Teaching experiences

3. Classes taught

4. With all the experiences that you have in the teaching fields, what do you think is the best approach of teaching directed numbers?

5 When do you think is the appropriate time to introduce directed numbers?

6. Do you use concrete objects to teach the topic of directed numbers?

7. What are the reactions of learners when directed numbers are introduced?

8. What challenges do learners face when learning directed numbers?

APPENDIX D

Pre –test

Simplify the following. You can use a number line where possible

1. 9 - 4 = (1)
2. -2 + 3 = (1)
3. -4 – 2 = (1)
4. 32 – 35 = (1)
5. -19 – 21 = (1)
6. -4 - (-1) = (1)
7. (-2) x (+3) = (1)
8. (-4) X(-5) = (1)
9. (-10) ÷ (+2) = (1)
10. (-16) ÷ (-4) = (1)
11. 11 -14 + 6 = (2)
12. -5 +8 -7 = (2)
13. -5 -(-21) -15 = (2)
14. (-24 ×3) ÷ 6 = (2)
15. (-30) × 4 +2 = (2)

APPENDIX E

POST TEST

Each question carries one mark

1. 5 + 7 =
2. 4 + (-9) =
3. The temperature in a refrigerator is -8 degrees Celsius. If it increases by 4 degrees, what will be the new temperature?
4. -4 + (-7) =
5. -5 +9 =
6. -9 -7 =
7. 7 -10 =
8. Solve the equation 8 – 2x =
9. 8 - (-9) =
10. -8 – (4) =
11. -9 –(8) =
12. 8 × (-7) =
13. Find the sum -8 and 6
14. Subtract -2 from 2
15. (-3) ×(-3) =
16. $(-8)^2$ =
17. $-(-6)^2$ =
18. -15 ÷ (-3) =
19. 0-(-4) =
20. (-15) × (6) =

ETHICAL CLEARANCES

Reference: CHISENYE. L

E. C. No.: 5504036X

All communications should be addressed to
"The Provincial Education Director
Mashonaland East Province"
Telephone: 0279-24811/4 and 24792
Telex :
Fax: 079-24791
E-mail: mopsemeped@hotmail.com

ZIMBABWE

Ministry of Primary & Secondary Educ
Mashonaland East Province
P.O. Box 752
Marondera
Zimbabwe

17/05/2024

~~Mr~~./Mrs./Miss CHISENYE LINAH
MUZEZURU SEC SCHOOL
P.O. BOX 24 MUDZI

PERMISSION TO CARRY OUT RESEARCH IN SCHOOL FOR EDUCATIONAL PURPOSES: ~~MR~~/MRS/MISS CHISENYE. L **E. C. NO.** 5504036X
STUDENT I. D. B225503B **TEACHER AT** MUZEZURU SEC **SCHOOL**

Reference is made to your minute dated 13 MAY 2024
Please be advised that permission has been granted that you carry out research work in our schools. You are accordingly being asked to furnish the Ministry with information about your findings so that we share the knowledge for the benefit of the system as well as our nation at large.

We wish you all the best and hope to hear from you after completing your project work.

MIN. OF PRY. & SEC. EDUCATION
HUMAN RESOURCES DISCIPLINE
MASHONALAND EAST PROVINCE
17 MAY 2024
P.O. BOX 752, MARONDERA
ZIMBABWE TEL: 0279-21806

Michael. S

HUMAN RESOURCES OFFICER – DISCIPLINE
FOR PROVINCIAL EDUCATION DIRECTOR
MASHONALAND EAST PROVINCE
/mm

SAMED

P Bag 1020
BINDURA
ZIMBABWE

Tel: 0271 - 7531 ext 1038
Fax: 263 - 71 - 7616

BINDURA UNIVERSITY OF SCIENCE EDUCATION

Date: ----------

TO WHOM IT MAY CONCERN

NAME: CHISENJE LINAH REGISTRATION NUMBER: B225503B

PROGRAMME: HBScEdMt PART: 2.1

This memo serves to confirm that the above is a bona fide student at Bindura University of Science Education in the Faculty of Science Education.

The student has to undertake research and thereafter present a Research Project in partial fulfillment of the HBSc Ed Mt programme. The research topic is:

Knowledge Attitudes and Perceptions in the Teaching and Learning of Directed Numbers at Secondary School Level: A Case of Mudzi District.

In this regard, the department kindly requests your permission to allow the student to carry out his/her research in your institutions.

Your co-operation and assistance is greatly appreciated.

Thank you

BINDURA UNIVERSITY OF SCIENCE EDUCATION
DEPARTMENT OF EDUCATIONAL FOUNDATIONS
9 APR 2024
P. BAG 1020
BINDURA

Z/Ndemo (Dr.)
CHAIRPERSON - SAMED

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