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## DIFFICULTIES ENCOUNTERED BY TEACHERS AND LEARNERS ON MATHEMATICS INVOLVING INTEGERS: BASES FOR PROGRAM INTERVENTION IN MATHEMATICS

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### ABSTRACT

This descriptive qualitative study examined the difficulties encountered by teachers and learners in mathematics lessons involving integer operations. Findings showed that learners consistently struggled to understand concepts, analyze and apply rules, and handle unlike signs, especially with large numbers. In addition, they had trouble combining negative values and following sign rules. In subtraction, difficulties involved whole-number manipulation and rule accuracy. In multiplication and division, persistent problems with sign rules and large numbers led to errors and hesitation. Teachers attributed these issues to short attention spans, weak comprehension, limited prior knowledge, low motivation, poor memory retention, math anxiety, and low self-confidence, compounded by limited instructional materials available. Overall, the results highlight the need for strengthened foundational instruction, sustained motivation, and targeted interventions to improve mastery of integer operations.

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**Keywords:** *Difficulties, Teachers, Learners, Mathematics Involving Integers, Program Intervention*

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## INTRODUCTION

Mathematics plays a crucial role in our daily lives. It can be rightly said that a citizen of the modern world cannot afford to be ignorant of mathematics because the world we live in is highly mathematical. Therefore, effective mathematics instruction at all levels of education is absolutely necessary. Quality mathematics education at higher levels can only be achieved if a strong mathematical foundation is mastered.

Mathematics is perceived as a challenging subject by many students. Research indicates that learners often describe mathematics as frustrating and confusing, particularly when instruction emphasizes isolated facts, rules, and formulas without sufficient conceptual understanding. Such perceptions can negatively influence students' attitudes, confidence, and overall performance in mathematics (OECD, 2023; Frontiers Media, 2022). Learners feel hard to understand concepts and word problems and lack of motivation to continue trying in getting the right answer.

Many students enter high school with weak concepts and skills in mathematics. One of these foundational skills and areas of knowledge is understanding integers. A crucial foundation for solving various equations, such as performing operations on integers, involves understanding the signs of the numbers as well as the signs of the required operations.

This often causes confusion for students when they encounter questions that require performing operations on integers, especially when asked to solve problems with integers within an allotted time, aiming to compute more efficiently and with better conceptual understanding.

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The concept of integers forms the foundation of algebra in primary school mathematics and is considered an important prerequisite for higher mathematics courses.

Additionally, this concept symbolizes the transition from concrete thinking to abstract thinking. The role of methods and models is crucial since 6th-grade students, who are in the process of transitioning from concrete to abstract operations, encounter the concept of integers for the first time.

In the past, the concept and operations of integers were taught using algebraic rules, rather than being explained with models. Innovative strategies, including various methods and models, are now employed to help students learn and understand abstract concepts, such as integer calculations.

The researcher observed that most high school students struggle with mathematics. It is also a general observation that high school students lack proficiency in basic math skills. Mathematics teachers often complain about students' lack of mathematical skills, particularly when it comes to learning integers and performing the four fundamental operations.

At Janiway National Comprehensive High School, where the researcher is currently teaching, she observed learners' difficulty in mathematics across all lessons. It was later discovered that their challenges stem from issues related to integers and the four fundamental operations. All lessons or topics in the subject involve integers, and students are unaware of the rules, which leads to incorrect answers. Sometimes, they are unable to arrive at any answers at all.

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As a mathematics teacher, the researcher conducted this study because she has observed and experienced the low level of mastery and the difficulties learners face in mathematics, particularly with integers and the four fundamental operations. This situation sparked the researcher's interest in studying and contributing to finding a solution to the challenges students face today.

## MATERIALS AND METHODS

### Research Methodology

This chapter outlines the methodology of the study, including the research design, participants, data collection procedures, research instruments, and data analysis methods. The primary aim of this study is to identify the challenges faced by both learners and teachers when learning and teaching integers, specifically related to the four basic arithmetic operations. These insights may inform the development of an intervention program to address these challenges.

### Research Method

The research method employed in this study was qualitative research, utilizing in-depth interviews. During the interview, the interviewer and interviewee were seated at a comfortable distance, allowing the interviewee time to reflect on a series of questions related to a specific issue. The goal of this approach was to gather the essential perspectives of the participants on the issue at hand, considering the social context, by analyzing their responses to the questions.

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## Research Design

The study employed a phenomenological research design, a philosophical approach in qualitative research. Phenomenology aims to understand how individuals perceive the world and how their views may differ from commonly accepted perspectives. This approach focuses on a person's subjective interpretation of their experiences. In phenomenological research, participants are interviewed to gather their impressions and insights, making it a useful method in fields like psychology, sociology, and social work.

Phenomenology systematically examines the structures of consciousness from a first-person perspective, concentrating on how individuals perceive, interpret, and derive meaning from their experiences (Stanford Encyclopedia of Philosophy, 2023; Routledge, 2022).

A central concept in phenomenology is the intentionality of experience, meaning that every experience is directed toward something, often an object. This intentionality is formed through the content or meaning of the experience, which represents the object, and the enabling conditions that allow the experience to occur.

## Participants of the Study

The participants of the study consisted of thirteen (13) teachers and six (6) learners, who were purposely selected from the official enrollment records for the school year 2022-2023.

## Sampling Design

The study employed a purposive sampling design. Purposive sampling is a non-probability sampling technique where participants are selected based on specific

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characteristics of the population and the objectives of the study. This method is also referred to as judgmental, selective, or subjective sampling, as it involves the researcher making deliberate choices about who should be included in the sample based on relevant criteria.

### Research Instrument

The research instrument used in the study was a researcher-made interview schedule. The interview schedule contained four questions that were aligned with the purpose of the study. Voice and video recorders were employed for data collection and documentation, with the participants' permission.

### Validity of the Research Instrument

Before determining the validity of the interview schedule created by the researcher, it was reviewed by the adviser, the Dean of the Graduate School, and a panel of jurors with expertise in research, testing and assessment, and English. These individuals were asked to validate each question and provide suggestions for review and modification.

Validity refers to the appropriateness, meaningfulness, and accuracy of the inferences and conclusions that a researcher draws from data. In the context of content validity, the items, format, and content of an instrument must align with the defined constructs and the target population to ensure that the measurement accurately reflects what it is intended to measure. Ensuring content validity is essential for evaluating the quality and credibility of research instruments such as questionnaires and surveys (American Educational Research Association, 2023; SAGE Publications, 2022).

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The comments, corrections, and suggestions provided by the panel of validators regarding the interview schedule were taken into account, using the appropriate form based on Good and Scates (Appendix A).

### Data Gathering Procedures

Permits were obtained from the adviser, the Dean of the Graduate School, the Office of the Schools Division Superintendent, the Office of the District Supervisors, School Heads, and individual participants to authorize the researcher to conduct the study. The researcher personally visited the schools, community, or locations that were most convenient for the participants to carry out the interviews.

Before conducting the interviews, the researcher encouraged participants to sign a waiver or permission form related to the study. During the in-depth interviews, voice and video recorders were provided to ensure that the interviewee's responses were fully captured. After completing the series of interviews, the researcher consolidated all the collected data.

### Data Analyses

The information gathered was analyzed using a thematic approach. Thematic analysis is a qualitative research method that systematically identifies, analyzes, and interprets patterns or themes within data. The primary goal of thematic analysis is to uncover recurring concepts or significant insights that help address the research questions and provide a deeper understanding of the studied phenomenon. The process involves summarizing, coding, and interpreting the data to reveal patterns that reflect the participants' experiences and perspectives (SAGE Publications, 2023; Routledge, 2022).

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## RESULTS AND DISCUSSIONS

The study was conducted to determine the difficulties encountered by learners and teachers in learning and teaching integers involving the four fundamental operations as bases for program intervention in mathematics in Janiuay National Comprehensive High School during the school year 2022-2023.

The study employed a qualitative research method using in-depth interviews, with a phenomenological research design. The participants consisted of thirteen (13) teachers and six (6) learners, selected purposefully from the official enrollment records for the school year 2022-2023.

A researcher-made interview schedule was used as the data collection tool. Voice and video recorders were also utilized for data gathering and documentation, contingent on participant consent. The interview schedule underwent content validation by a panel of experts, with the criteria for validation based on Fraenkel and Wallen's (2007) guidelines.

The researcher took into account all comments and suggestions related to the validation process. Once the interview schedule was deemed valid, the necessary permits were obtained to begin conducting the in-depth interviews.

Permits from the adviser, Dean of the Graduate School, Office of the Schools Division Superintendent, School Head, and the individual participants were secured to allow the researcher to proceed with the study.

The researcher visited the schools, community, or locations that were convenient for the participants to conduct the interviews.

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After the interviews were completed, the researcher consolidated all the collected data, which was then analyzed and interpreted using a thematic approach.

The study's findings are as follows:

From the in-depth interviews with learners, it was found that learners' difficulties in learning integers involving the four fundamental operations were related to understanding the lesson and analyzing the rules.

Regarding addition of integers, learners encountered difficulties with combining negative signs, working with unlike signs, developing an appreciation for Mathematics, and understanding the concepts.

In learning subtraction of integers, learners struggled with dealing with whole numbers and grasping the rules.

When learning multiplication of integers, difficulties arose with handling unlike signs, working with large numbers, and fostering a love for mathematics.

In division of integers, learners faced challenges with unlike signs, large numbers, overcoming math anxiety, and factors related to the teacher.

From the in-depth interviews with teachers, it was found that teachers' difficulties in teaching integers involved the four fundamental operations were related to students' attention spans, comprehension skills, prior knowledge of the topics, lack of instructional materials and equipment, and low learner motivation.

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In teaching the addition of integers, teachers identified difficulties with understanding unlike signs, learners' memory retention, foundational knowledge of the topics, and lack of motivation to learn.

For subtraction of integers, teachers noted challenges with understanding the rules, students' memory retention, and students' self-confidence.

In teaching multiplication of integers, difficulties were observed in students' memory retention, embracing the concept of integers, and students' ability to analyze the material.

Finally, in teaching division of integers, teachers faced challenges related to students' understanding of the concept, lack of motivation, and issues with memory retention.

Based on the findings, the following insights were drawn:

Learners show a lack of commitment and interest in learning mathematics, particularly concepts involving integers.

The rules on integers—especially the rules of signs—were not fully understood or retained by learners, possibly because these were not discussed clearly or thoroughly by teachers. This may have contributed to low comprehension and a weak appreciation of the subject.

Learners may also develop a negative impression of studying integers due to teacher-related factors or because their needs and weaknesses were not given sufficient attention.

In addition, learners may lack motivation to learn integers because the lessons were not engaging, or because more appealing instructional materials, devices, and equipment are needed to support instruction.

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## Conclusion

Based on the findings and insights gained from this study, the following recommendations are proposed:

The school should come up with an effective strategy on how to develop the learners commitment and sincerity to learn in their mathematics subject especially with the integers.

The school head should place greater emphasis on supervisory activities by closely monitoring teachers' instructional practices to help improve learners' understanding of integer rules, strengthen comprehension, and encourage learners to embrace the subject.

Teachers should find ways and means on how to develop and change the negative impression of learners in learning integers to positive one.

All activities related to teaching-learning process should be attractive to the learners to develop their motivation to learn integers.

A copy of the intervention program should be submitted to the Schools Division Office, Regional Office, and Central Office for their approval and implementation.

If approval for the recommended intervention program is not granted, school heads are encouraged to implement the program locally, on a case-by-case basis.

It is also recommended that future studies on this topic be conducted, considering additional variables that were not included or mentioned in the current study.

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