



Unlocking The Secrets Of Percentages: Helping Class 8th Students In Understanding The Concept Of Percentage

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ABSTRACT

The concept of percentage is fundamental in mathematics and essential for real-life applications, yet many Class 8 students struggle to understand and apply it effectively. This action research aimed to identify the difficulties faced by students in learning percentages and implement activity-based teaching strategies to enhance conceptual understanding. A sample of 13 students from Vasavi Vidyanikethana, Mysuru, who scored below average in a pre-test, participated in interventions such as “Know Your Scores,” “Discount Shopping Simulation,” “Real-Life Bill Analysis,” and “Pie Chart Art.” Pre- and post-tests revealed significant improvements, with students’ scores increasing by 20% to 45%, indicating enhanced comprehension, practical application, and confidence. The study highlights the effectiveness of experiential, visual, and real-life-based strategies in fostering mathematical understanding, problem-solving skills, and positive attitudes toward learning percentages. These findings underscore the need for innovative, student-centered teaching approaches to strengthen conceptual clarity and promote lifelong mathematical skills.

Keywords: Percentage, Experiential Learning, Activity-Based Teaching, Real-Life Applications, Visual Learning, Problem-Solving Skills

INTRODUCTION

Mathematics plays a vital role in cognitive development, problem-solving, and decision-making. Among its topics, percentages are especially important due to their wide applications in academics and daily life. However, many 8th-grade students struggle to understand and apply percentages, often due to the abstract nature of the concept and weak foundational knowledge in fractions and decimals. Misconceptions, learning gaps, and procedural errors are common, affecting performance in assessments. This study aims to identify the root causes of these difficulties, examine common misunderstandings, and develop effective teaching strategies to improve students’ conceptual clarity, mathematical proficiency, and confidence.

NEED AND IMPORTANCE:

1. **Essential Math Concept:** Percentages are a core component of mathematics, used widely in school, daily life and various careers.
2. **Application in Daily Life:** Understanding percentages is essential for interpreting data in discounts, taxes, interest rates, test scores and the media.
3. **Conceptual Challenges:** Many students struggle to relate percentages to fractions and decimals, which indicates a deep conceptual gap.
4. **Overemphasis on procedure in teaching:** Education focuses on formulas and shortcuts rather than helping students build real understanding.
5. **Academic Performance:** Difficulty with percentages affects performance on tests and hinders progress in higher math subjects.
6. **Impact on Financial Literacy:** Misunderstanding percentages can lead to poor financial decisions, such as misjudging loans or investments.
7. **Understanding percentiles is essential for STEM and Non-STEM fields:** Understanding percentiles is essential in subjects such as science, economics and public health.
8. **Global learning concerns:** International assessments (PISA, TIMSS) show that percentile-related questions are often poorly answered, suggesting a broader problem.
9. **Need for better teaching strategies:** The study supports the development of improved, student-centered teaching methods such as visual aids, real-life problems and interactive tools.
10. **Preventing math anxiety:** Addressing these difficulties early can help reduce frustration and anxiety, promoting a positive attitude toward math.

STATEMENT OF THE PROBLEM:

The concept of percentage is vital in mathematics and daily life, used in calculating discounts, taxes, interest, nutrition, and statistics. Many 8th-grade students struggle with understanding and applying percentage formulas. This study aims to identify the root causes of these difficulties and develop strategies to improve learning and practical application.

OBJECTIVES

1. To identify the difficulties faced by Class-8 students in understanding the concept of percentage.
2. To develop effective teaching strategies to improve conceptual understanding of percentages.
3. To implement effective teaching strategies to improve conceptual understanding of percentages.
4. To assess the effectiveness of these strategies in enhancing students' understanding and performance.
5. To evaluate changes in students' attitudes and confidence levels in solving percentage-related problems.
6. To suggest recommendations for future instructional improvements based on the outcomes.

CAUSES OF THE PROBLEM

1. **Lack of understanding of fractions and decimals:** Many students struggle with percentages because they have not mastered the fractions and decimals necessary to grasp percentage concepts.
2. **Limited use of visual aids:** There is often a lack of diagrams or models in instruction, which makes it difficult for students to understand percentages as part-to-whole relationships.
3. **Weak background in basic arithmetic:** Without strong skills in addition, subtraction, multiplication and division, students struggle to perform percentage calculations.
4. **Difficulty recognizing ratio relationships:** Students often do not see the ratio connections needed to solve percentage problems.
5. **Overreliance on rote learning:** Memorizing formulas without understanding leads to confusion when faced with unfamiliar percentage problems.
6. **Lack of real-world applications:** When percentages are taught in isolation from everyday use, students find them less meaningful and difficult to grasp.
7. **Difficulty making connections to real life:** Students struggle to relate percentages to real-life situations such as discounts or statistics, reducing motivation and comprehension.
8. **Insufficient practice:** Limited exposure to a variety of percentage problems hinders students' ability to apply the concept flexibly and accurately.
9. **Language barriers:** Students who are not fluent in the language of instruction may misunderstand terms and instructions related to percentages.
10. **Math anxiety:** Fear or stress related to math can hinder students' ability to focus and process percentage concepts effectively.

PRIORITIZED CAUSES

1. Lack of understanding of fractions and decimals.
2. Weak background in basic arithmetic.
3. Difficulty recognizing proportion relationships.
4. Over-reliance on rote learning.
5. Lack of real-world applications.

REVIEW OF RELATED LITERATURE

Siligar P.E.I. et al. (2022) conducted a study titled *“Understanding the Concept of Percent Using the Egg Rack”* to help students grasp percentages through a familiar, real-life context. Using the egg rack, students explored prior knowledge, represented problems in bar form, converted them to fractions, and then expressed them with a denominator of 100, linking concrete experiences to abstract percentage concepts. This approach helped students' progress from informal to formal understanding, improving conceptual clarity and problem-solving skills. Despite limitations like background noise and absence of full statistical analysis, the study emphasized using contextual, meaningful learning experiences to make percentage learning engaging and relevant.

Lestiana H.T. (2021) studied the difficulties prospective mathematics teachers face in solving percentage problems and their strategies. Participants attempted five problems, mostly contextual, but scored below 50% on average. They relied on formal algorithms like equations and long division, reflecting conventional teaching's emphasis on memorization over conceptual understanding. Many misunderstood the percent symbol as a unit rather than a relational concept, struggled with referent quantities, and had difficulty with "find-the-whole" problems. The study concluded that even advanced training does not ensure percentage comprehension. Visual tools, such as bar models, are recommended to strengthen understanding and teaching effectiveness.

Putrawangsa S. et al. (2021) examined how spatial representation, especially bar models, enhances students' understanding of percentages. Bar models helped students visualize percentages as ratios, part-whole relationships, and operators, enabling strategies like doubling, halving, ratio reasoning, and combining percentages. Though students struggled with very small percentages, the study highlighted that spatial representation fosters independent reasoning and conceptual understanding. Bar models supported flexible counting, mental computation, estimation, and tracking calculations. Overall, using bar models made percentage reasoning more structured, visual, and contextually grounded, significantly improving students' problem-solving abilities and conceptual clarity in learning percentages.

Rianasari V. F. et al. (2012) aimed to develop a local instructional theory to enhance students' understanding of percentages using a design research method. The study emphasized the teacher's role in creating a supportive classroom culture and facilitating knowledge construction. Teachers were encouraged to use real-life contexts—such as discounts, loading processes, and area calculations to make learning meaningful. While students knew procedural algorithms for percentage problems, the research focused on designing activities that required conceptual understanding rather than rote computation. This approach helped students extend their knowledge and apply percentage concepts in authentic, practical situations.

RESEARCH METHODOLOGY

This research was based on the quantitative methodology.

Quantitative methods: A pre-test and post-test design was used to measure students achievement before and after the interventions.

Research tool:

The researcher developed questionnaire was used as a research tool. The questionnaire consisted of 20 marks which includes-Multiple choice questions, Fill in the blanks, Match the following, Short answer questions.

Sample design:

Population: The population of the study is 8th standard students of Vasavi Vidyanikethana located in Kuvempunagara, Mysuru. The school belongs to Kuvempunagara Cluster, South Block of Mysuru district.

Sample Size: The sample of the study is 8 students belonging to 8th standard of Vasavi Vidyanikethana based on purposive sampling technique. i.e., only those students who scored the marks below average in the pre-test were selected to participate in the intervention activities.

PROCEDURE

1. **Pre-Test :** A test was conducted to check the students existing understanding of the concept percentage
2. **Identification of Learning Difficulties:** During the preliminary activity, students who faced difficulties in understanding the concepts of percentages were identified through a diagnostic questionnaire and observation.
3. **Planning and Implementation of Activities:** To address these difficulties, several engaging and practical activities were organized, namely:
 - ❖ “Know Your Factors” - To relate percentages with points or scores.
 - ❖ “Discount Shopping Simulation”-To understand percentage reduction in discounts and real-life applications.
 - ❖ “Real-Life Bill Analysis”-To explore how percentages are used in calculating GST, tips and discounts.
 - ❖ “Pie Chart Art” -To visualize percentages as parts of a whole through creative representation.
4. **Guided Practice and Discussion:** The researcher guided students through each activity, encouraged peer discussion and provided feedback to reinforce conceptual understanding.
5. **Post-test administration:** After completing all activities, a post-test was administered to evaluate the effectiveness of the teaching strategies and measure the percentage improvement in student understanding.
6. **Analysis of Results:** Pre- and post-test results were compared to determine the progress in students’ conceptual clarity and performance after implementing the new strategies.

ACTION PLAN

Table-1: Details of Action Plan

Sl. No.	Activities	Duration	Frequency	Remarks
1	Teaching of theoretical concepts and formulas	20 Minutes	1 Day	A foundation is created to connect theoretical learning to subsequent practical and applied activities.
2	Know Your Scores	10 Minutes	1 Day	When students calculated their own academic performance in percentages, self-evaluation and reflection were encouraged.
3	Discount Shopping Simulation	20 Minutes	Once in a week	Improved understanding of discount and sales calculations, linking percentages to real-world financial literacy.
4	Real - life Bill Analysis	15 Minutes	Once in a week	It helped students understand the real-world relevance of concepts like GST, discounts and taxes.
5	Pie - Chart Art	20 Minutes	1 Day	Students' ability to visualize and interpret numerical data is improved through pie charts.

DESCRIPTION OF ACTION PLAN

1. Teaching of theoretical concepts and formulas :

This activity involved teaching 8th grade students the theoretical concepts and formulas related to percentages. During this activity, the researcher observed that many students were struggling to convert fractions and decimals to percentages and to understand the concept of percentage increases and decreases. Through class discussions and diagnostic questions, for example

1. What does the word "percent" mean?
2. How is the number 50% different from 50?

The researcher identified specific misconceptions - for example, confusing "percent" with "per number" or treating percentages as whole numbers. After identifying these difficulties, the researcher explained the basic concepts related to percentages, including fractions and decimals. This helped the students learn to convert fractions and decimals to percentages and to accurately calculate percentage increases and decreases.

2. Know Your Scores:

Based on the identified gaps, the researcher designed practical activities such as Know Your Scores, a discount shopping simulation and a real-life bill analysis. In this activity, the researcher asked 8th grade students to refer to their past test scores and analyze their recent test results. They were then instructed to calculate the percentage of marks they had obtained in each subject using the formula: $\text{Percentage} = \frac{\text{Marks Obtained}}{\text{Total Marks}} \times 100$.

Their scores were expressed as percentages. The activity incorporated real-life examples and encouraged collaborative learning strategies, making the concept of percentages more meaningful and concrete. It helped students strengthen their practical use of percentages by promoting self-assessment, analytical thinking and statistical skills.

3. Discount Shopping Simulation:

The researcher implemented an effective teaching strategy through an interactive and experiential activity called "Discount Shopping Simulation". In this interactive activity, students actively participated in a simulated market setting where they calculated discount prices on various items such as bags, bottles, geometry boxes, notebooks, etc. They applied the formula to calculate the discount prices:

$\text{Discount Price} = \text{Original Price} - (\text{Discount \%} \times \text{Original Price} / 100)$.

Using price tags and mock money, students practiced real-life applications of percentages. This enabled them to experience decision-making situations involving percentages, such as comparing prices and savings. Linking mathematics to real-world financial literacy improved understanding of discount and sales calculations and developed mental math and estimation skills while engaging in a fun, simulated market setting.

4. Real life Bill Analysis:

In this activity, the students were given sample utility or grocery bills and analyzed them to calculate taxes, discounts and due amounts using percentage formulas. The effectiveness of the strategies implemented through this activity was clearly observed. Students were able to accurately apply percentage formulas when calculating taxes, discounts and total bills, demonstrating strong conceptual understanding and improved performance. They showed significant progress in interpreting real-world data, comparing percentages between items and relating classroom learning to practical situations. Furthermore, students' confidence and attitudes toward mathematics improved significantly. Handling official bills and discussing GST, savings and discounts made learning meaningful and relevant, reducing the fear of numerical problems. As a result, learners not only increased their academic performance, but also developed a positive outlook toward using percentages in everyday decision-making.

5. Pie Chat Art:

In this creative activity, students collected data from their daily routines (e.g., time spent sleeping, studying, playing, etc.) and converted it into percentages. They then represented that data by drawing a colorful pie chart that divided the circle based on the percentage share of each activity. This activity provided valuable insights for future teaching improvements because it showed that integrating art and visual representation into mathematics makes abstract concepts like percentages more concrete and engaging. The students' active participation and enthusiasm suggested that visual learning not only aids comprehension but also sustains interest in the subject. Based on these results, it is recommended that teachers incorporate more interdisciplinary and practical techniques such as data visualization projects, digital graphing tools and collaborative art-based math tasks to strengthen conceptual clarity and long-term retention. Thus, the activity highlighted the importance of adopting innovative and learner-centered approaches in future teaching practices.

DATA ANALYSIS

The statistics represents the different data about the samples, the data includes pre-test and post-test scores, test differences and percentage of student improvement (samples) after conducting the activities in order to reduce the difficulties in learning among the students.

Table-2: Details of Samples' test scores

Sl. No.	Name of Students	Pre-Test Scores	Post-Test Scores	Difference	% of improvement
1	VV81	6	12	6	30%
2	VV82	12	18	6	30%
3	VV83	12	16	4	20%
4	VV84	5	14	9	45%
5	VV85	10	14	4	20%
6	VV86	10	18	8	40%
7	VV87	11	15	4	20%
8	VV88	10	18	8	40%
9	VV89	5	14	9	45%
10	VV810	8	15	7	35%
11	VV811	5	14	9	45%

12	VV812	11	15	4	20%
13	VV813	4	12	8	40%

Pre-Test

Table-3: Frequency distribution table of Pre-Test

Marks	Frequency (f)	Midpoint (x)	fx	Cumulative frequency
1-5	4	3	12	4
6-10	5	8	40	9
11-15	4	13	52	13
16-20	0	18	0	13

Central Tendency: Mean = 8, Median = 8, Mode = 8

Post-Test

Table-4: Frequency distribution table of Post-Test

Marks	Frequency (f)	Midpoint (x)	fx	Cumulative frequency
1-5	0	3	0	0
6-10	0	8	0	0
11-15	9	13	117	9
16-20	4	18	72	13

Central Tendency: Mean = 14.53, Median = 14.11, Mode = 13.27

GRAPHICAL REPRESENTATION

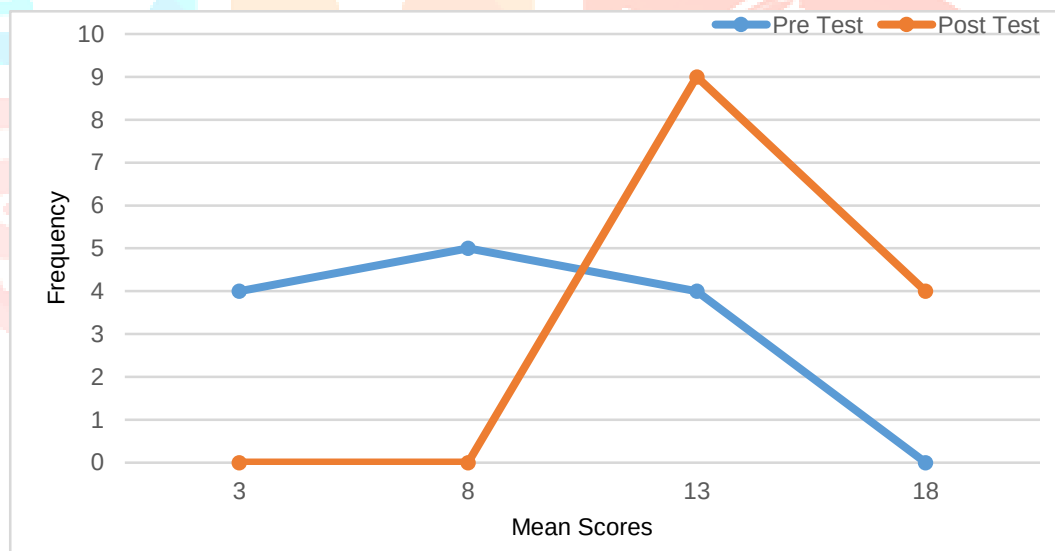


Figure-1: Line graph of Students Performance in Pre-Test and Post-Test

INTERPRETATION OF RESULT

The pre-test of 20 marks was given to the 13 students of class 8th to check the basic understanding level of the concept of percentage. In this test out of 13 students, 9 students scored marks between 5 to 10. This indicates that they have less understanding of the concept and faced difficulty in learning and applying the concepts. And 4 students have scored above 10 marks that shows they had a basic understanding of the concepts and faced difficulty in calculations and application of formulas related to the concepts. After conducting a series of structured and experiential learning activities, such as knowing your scores, Discount

shopping simulation, Real-life Bill Analyses and Pie charts - students demonstrated noticeable progress in both theoretical and practical comprehension.

When the post-test was conducted, all the 13 students showed improvement in their scores compared to the pre-test. The 9 students who scored below 10 marks in the pre-test progressed and improved their understanding level of the concepts by scoring up to 18 marks in the post-test and 4 students who scored above 10 marks in the pre-test were also reached the maximum marks up to 18. It is evident that all students showed improvement in their post-test results. The percentage of improvement ranged from 20% to 45%, indicating that the activity-based learning methods were highly effective in addressing conceptual gaps. The graphical representation of pre-test and post-test scores also shows a clear upward trend for every student, emphasizing the positive learning outcomes of the intervention. Overall, the findings confirm that experiential, real-life-based and visual strategies significantly enhanced students' conceptual understanding, problem-solving ability and confidence in dealing with percentage-related problems.

RESEARCH FINDINGS

1. In the pre-test, all 18 students scored 5 to 12 out of 20. This showed that some had a poor foundation in the basic concepts related to percentage and some had a basic understanding of the percentage concept. And all the students showed that they lacked real-life examples and had limited practical experiences.
2. After being taught theoretical concepts such as fractions and decimals related to percentage, students were able to accurately convert fractions and decimals into percentages and apply these concepts to real-life problems.
3. Activities such as Know Your Scores, Discount Shopping Simulation, Real-Life Bill Analysis made learning more engaging and meaningful. Students could relate abstract mathematical ideas to real-life situations. This increased understanding and retention.
4. The percentage of improvement among students ranged between 20% and 45%, indicating positive learning growth for each participant.
5. About 40% of students achieved an improvement rate of more than 35%, indicating strong conceptual growth through experiential learning activities.
6. Students who actively participated in practical activities such as bill analysis and shopping simulations showed greater score gains compared to others.
7. The average increase in post-test scores across the group showed that real-life applications and visual aids made learning more effective.
8. The graph depicting pre-test and post-test scores clearly shows a consistent upward trend for all learners, confirming the success of the intervention.
9. The findings highlight that activity-based and contextual teaching strategies significantly improved both performance and retention of mathematical concepts.
10. Overall, the improvement in scores validates the effectiveness of incorporating real-life experiences and creative tasks in mathematics teaching.

SUGGESTIONS

1. **Use real-life contexts:** Relate percentage lessons to real-life examples such as shopping discounts, test scores and utility bills to make learning meaningful and relatable.
2. **Incorporate hands-on activities:** Conduct simulations, games and experiments such as “shopping with pretend money” or “bill analysis” to encourage active learning and engagement.
3. **Promote inquiry-based learning:** Encourage students to ask questions, explore patterns and discover formulas through guided exploration rather than memorization.
4. **Encourage self-assessment:** Provide opportunities for students to calculate their own scores and progress in percentages to foster self-awareness and responsibility for learning.
5. **Develop financial literacy:** Include examples involving taxes, savings and interest to enhance students’ understanding of how percentages are used in financial decisions.
6. **Differentiate instruction:** Modify activities and examples based on students’ learning level provide additional support for weaker students and challenging tasks for advanced learners.

CONCLUSION

The implementation of the action plan on the concept of percentage proved to be highly effective in enhancing students’ conceptual understanding, practical application and overall interest in mathematics. Through a series of well-planned activities such as teaching theoretical concepts and formulas, Know Your Points, Discount Shopping Simulation, Real-Life Bill Analysis and the Art of Pie Chat, students were able to connect classroom learning with real-life situations. These activities not only helped to clarify misconceptions and strengthen computational skills but also encouraged active participation, collaboration and self-assessment among students. While experiencing mathematics in meaningful contexts, learners developed essential skills such as data interpretation, analytical thinking and financial literacy. Post-assessment results and classroom observations indicated a significant improvement in students’ performance, confidence and attitude towards the subject. The experiential and visual methods used made it easier to grasp and retain abstract percentage concepts. Overall, the study highlights that incorporating real-life experiences, visual aids and creative tasks into mathematics teaching can make learning more engaging, effective and long-lasting. Such approaches should be more widely adopted to promote conceptual clarity and lifelong mathematical understanding in students.

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