A STUDY OF THE EFFECT OF TEACHING-LEARNING THROUGH NCERT MATHEMATICS KIT ON ATTITUDE, INTEREST AND ACHIEVEMENT IN MATHEMATICS OF CLASS 8TH STUDENTS

A

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NCERT

REGIONAL INSTITUTE OF EDUCATION

(A Constituent Unit of National Council of Educational Research & Training, New Delhi)

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CERTIFICATE

This is to certify that the dissertation entitled, **"A Study of the Effect of teaching-learning through NCERT Mathematics kit on Attitude, Interest and Achievement in Mathematics of class 8th Students"** submitted by Bharti Thakur, a student of Regional Institute of Education, Bhopal, is a record of bonafide research work carried out by her under my supervision and her dissertation is fir for submission.

I further certify that this work is original and fulfils all the requirement laid down in the ordinance of Barkatuallah University, Bhopal, relating to B.Ed.-M.Ed. (Integrated) (RIE).

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DECLARATION

I do hereby declare that the dissertation entitled "**A Study of Effect of Teaching-learning through NCERT Mathematics kit on Attitude, Interest and Achievement in Mathematics of class Eighth Students"** submitted to the Regional Institute of Education, Bhopal, is a record of an original work done by me, under the supervision of Dr. Saurabh Kumar, Associate Professor, RIE, Bhopal.

This dissertation is submitted as a partial fulfilment of the requirement for the award of the degree of three B.Ed.-M.Ed. (Integrated) program. The results embodied in this dissertation have not been submitted to any other university or institute for the award of any degree or diploma.

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Place: Bhopal **Bharti Thakur**

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INTRODUCTION OF THE STUDY

Chapter 1

INTRODUCTION

"To touch the shape of numbers with hand and mind,
To let each line and circle unwind—
The kit becomes the key, the child explores,
And mathematics walks through open doors."

1.0.0 Prologue

The present chapter expounds the background of this study. It consists of the Introduction and Background of the Study, Present Status of the Study, Need for the study, Statement of the Problem, Operational Definitions of the terms, and Assumptions of the Study, Objectives, Hypotheses, and Limitations of the study.

1.1.0 Introduction and Background of the study

The present study titled, “A Study of the Effect of teaching-learning through NCERT Mathematics kit on Attitude, Interest and Achievement in Mathematics of class Eighth Students” is an experimental study. In this study the researcher used NCERT Mathematics kit as instructional material to improve Achievement in Mathematics, develop positive Attitude towards Mathematics and enhance Interest in Mathematics among class Eighth Students.

Over the last few decades, there has been a significant shift in the philosophy and practice of mathematics education globally. Traditionally, mathematics was taught in a highly abstract, teacher-centred manner, focusing on formulae, rules, and procedural knowledge. Classrooms were often dominated by lectures, blackboard demonstrations, and repetitive problem-solving exercises. Students were expected to memorize steps and solve problems mechanically, with little room for exploration or conceptual understanding. This method, although structured, failed to cater to diverse learning needs and contributed to widespread math anxiety, low interest, and poor retention, especially among students at the elementary and middle school levels.

In contrast, contemporary approaches to mathematics teaching emphasize conceptual clarity, student engagement, and real-life application. The modern educational

perspective recognizes that mathematics is not just a set of rules but a way of thinking and reasoning. As a result, there is a growing emphasis on activity-based learning, experiential education, and constructivist teaching models. These methods view the learner as an active participant in the learning process who builds knowledge through hands-on experiences and meaningful exploration.

1.1.1 The Importance of Mathematics in Education

Mathematics serves as a universal language and a significant instrument for comprehending the world. It is a fundamental aspect of human culture and has played a crucial role in the advancement of science, technology, and logical reasoning. Within the school curriculum, mathematics holds a critical position due to its contribution to fostering analytical thinking, problem-solving skills, spatial awareness, and clarity in communication.

At the middle school level, particularly in Class VIII, students are introduced to more abstract mathematical ideas such as algebra, geometry, linear equations, and data management. These concepts lay the groundwork for advanced mathematics and other science-related fields. Consequently, it is imperative that students at this stage not only grasp mathematical techniques but also cultivate a positive attitude towards the subject.

1.1.2 Challenges in Learning Mathematics

Despite its undeniable importance, mathematics is often regarded by students as a difficult and abstract subject. Many learners, particularly at the middle school level, struggle with concepts due to poor foundational understanding, a lack of meaningful context, and monotonous teaching methods. Traditional teaching practices, which often rely on chalk-and-talk approaches, repetitive drills, and rote memorization, fail to capture the interest of students or foster deep conceptual understanding. As a result, many students develop math phobia—a psychological aversion characterized by anxiety, lack of confidence, and avoidance behaviour.

The perception of mathematics as a rigid, rule-based subject creates barriers to learning. Students are often discouraged from asking questions or exploring alternative ways of solving problems, leading to a passive learning environment. Further, when mathematical knowledge is presented in a decontextualized manner, disconnected from students' daily experiences, it loses its relevance and appeal. These challenges are

exacerbated in large, heterogeneous classrooms where individual learning needs are often overlooked.

The problem is not just limited to students' performance in assessments but extends to their overall attitude and emotional relationship with the subject. A negative experience with mathematics during formative years can result in long-lasting academic struggles, reduced participation in STEM fields, and limited career choices. Thus, addressing the barriers in math learning requires a pedagogical shift toward more engaging, student-friendly teaching practices.

1.1.3 Shift toward Activity-Based Learning

In recent years, mathematics education has undergone a significant transformation, shifting from traditional rote-learning methods to more interactive and activity-oriented strategies. The constructivist learning theory, which forms the foundation of many contemporary educational philosophies, asserts that students achieve optimal learning outcomes when they actively participate in the educational process. Activity-based teaching fosters an environment where learners can manipulate objects, engage in problem-solving activities, and collaborate with their peers, thus turning learning into a vibrant and participatory experience. This approach emphasizes the discovery of patterns, comprehension of relationships, and visualization of abstract concepts in mathematics. By utilizing tangible materials or manipulatives such as counters, geometric models, or measuring tools, students can better understand concepts such as number sense, fractions, shapes, and measurements. This method not only deepens comprehension but also cultivates curiosity, creativity, and a love for learning.

Furthermore, activity-based techniques facilitate differentiated instruction by addressing various learning styles and multiple intelligences. For example, visual learners gain from diagrams and models, while kinaesthetic learners excel through hands-on activities. This inclusive strategy also aids in closing learning gaps among students from diverse socio-economic and linguistic backgrounds.

In the Indian educational landscape, characterized by crowded and varied classrooms, activity-based teaching presents an effective means to engage students in a meaningful way. It aligns with the objectives of the National Curriculum Framework (2005), which

promotes child-centered, constructivist education that prioritizes conceptual understanding over rote memorization.

1.1.4 Introduction to NCERT Mathematics Kit

The NCERT Mathematics Kit represents an innovative approach aimed at facilitating activity-based learning in mathematics education. Created by the National Council of Educational Research and Training (NCERT), this kit includes a diverse array of manipulatives and resources specifically designed to enhance the upper primary and secondary curriculum. The kit features geometric models, algebraic tiles, fraction discs, tangrams, number cards, and various measuring instruments, all of which correspond to particular mathematical concepts.

This kit enables students to engage physically with mathematical objects, allowing them to visualize intricate ideas in a more accessible way. For example, utilizing 3D shapes to investigate surface area and volume, or employing fraction circles to grasp part-whole relationships, promotes a tangible understanding of these concepts. Additionally, these resources facilitate collaborative work, inquiry-based learning, and immediate feedback, which are crucial for developing higher-order thinking skills.

Significantly, the NCERT Mathematics Kit empowers educators to transcend traditional textbooks, encouraging student engagement through demonstration, experimentation, and exploration. It also aids in classroom management, as students tend to stay focused and engaged when participating in hands-on activities. Numerous pilot studies and field observations have indicated that the implementation of the mathematics kit leads to improved student participation, interest, and comprehension. Nevertheless, despite its potential benefits, the kit is not consistently utilized across all educational institutions due to challenges such as inadequate teacher training, limited resources, or logistical issues. Therefore, it is essential to conduct empirical research to assess the kit's effectiveness and identify optimal practices for its application in various educational contexts.

1.1.5 Significance of Class VIII in Student Learning

Class VIII marks a pivotal point in a student's educational journey, facilitating the shift from primary to secondary schooling. During this phase, learners encounter more complex and abstract mathematical ideas, including algebraic expressions, linear

equations, geometry, mensuration, and data analysis. Mastery of these subjects necessitates not only procedural skills but also a deep understanding of the underlying concepts.

This period is crucial for students as they begin to develop enduring academic attitudes and preferences. A constructive experience in mathematics during Class VIII can establish a robust foundation for future academic success, whereas a negative experience may result in disinterest, underperformance, and a long-term aversion to mathematics. Consequently, this class is a vital opportunity for implementing innovative teaching methods, such as the NCERT Mathematics Kit. Additionally, adolescents at this stage possess the cognitive ability for advanced thinking but are also susceptible to stress, peer influence, and academic rivalry.

Therefore, it is imperative to create a joyful, interactive, and supportive learning environment to sustain motivation and promote well-being. The incorporation of tangible teaching resources and collaborative learning activities can render mathematics less daunting and more accessible for students at this developmental phase.

1.2.0 Need of the Study

1.2.1 Addressing Limitations of Traditional Mathematics Instruction

Conventional teaching approaches in mathematics predominantly focus on textbooks and lectures, prioritizing procedural skills rather than conceptual comprehension. This often results in students engaging in repetitive problem-solving without grasping the underlying principles. Consequently, learners tend to be passive and may struggle to apply mathematical concepts in diverse contexts. There is a pressing necessity to shift from these antiquated methods towards more engaging, student-oriented practices that promote critical thinking and effective problem-solving**.**

1.2.2 Importance of Hands-on and Experiential Learning

Recent educational studies and teaching theories strongly advocate for experiential learning as an effective approach to deepen student comprehension and involvement. When students engage in hands-on activities, observe trends, and formulate conclusions, their learning becomes more tangible and enduring. The NCERT Mathematics Kit offers a remarkable opportunity to integrate experiential learning

within the classroom. Its activities prompt students to explore and build mathematical understanding, thus enhancing their conceptual clarity and enthusiasm for the subject.

1.2.3 Need to Improve Students' Attitude and Interest in Mathematics

Numerous studies indicate that mathematics is frequently regarded as one of the most daunting and unpopular subjects by school students. This negative perception often results in anxiety, diminished self-esteem, and subpar academic outcomes. It is essential to foster a positive attitude towards mathematics, particularly during the middle school years. The implementation of innovative educational resources, such as the NCERT Mathematics Kit, can facilitate enjoyable learning experiences, thereby improving students' attitudes, interest, and motivation to engage with the subject**.**

1.2.4 Gap between Policy Provisions and Classroom Practices

Educational frameworks like the National Curriculum Framework (2005) and the National Education Policy (2020) emphasize the significance of experiential and activity-oriented learning, along with the integration of teaching aids in classroom interactions. The distribution of the NCERT Mathematics Kit to numerous government and private educational institutions illustrates this policy objective. Nevertheless, a significant disparity persists between policy and its execution. Educators frequently fail to utilize these kits consistently due to insufficient awareness, inadequate training, or time limitations. Therefore, it is essential to assess the genuine effects of the NCERT Mathematics Kit when it is effectively implemented in actual classroom environments.

1.2.5 Understanding Attitude, Interest, and Achievement

In the realm of education, especially within the field of mathematics, cognitive and affective elements are intricately linked. Attitude pertains to a learner's overall disposition, beliefs, and emotional responses towards the subject matter. It includes whether a student perceives mathematics as enjoyable or frustrating, and whether they consider it useful or irrelevant. A favorable attitude is often associated with enhanced engagement and performance, whereas an unfavorable attitude may result in disengagement and suboptimal outcomes.

Interest, conversely, represents the intrinsic motivation or curiosity that drives a student to delve deeper into mathematics. It encompasses enthusiasm, sustained focus, and a readiness to dedicate time and effort to comprehend the subject. Interest is dynamic and can be fostered through meaningful, relevant, and enjoyable educational experiences. The implementation of activity-based teaching methods, utilizing kits and manipulatives, is crucial in igniting and maintaining this interest.

Achievement in mathematics is the quantifiable learning outcome, generally evaluated through assessments such as tests, quizzes, and classroom performance. While achievement indicates a student's knowledge, it is frequently shaped by their attitude and interest. A student who feels confident and engaged is more inclined to excel academically. This research investigates how the three dimensions—attitude, interest, and achievement—are affected by the application of the NCERT Mathematics Kit, thus offering a comprehensive perspective on its influence on learning.

1.2.6 Alignment with Educational Reforms and National Goals

The National Education Policy (2020) aims to transform education by promoting competency-based learning and enjoyable experiences. It prioritizes enhancing students' understanding of concepts and their ability to solve problems over memorization. This study supports this vision and addresses the national objective of enhancing mathematics learning outcomes. By implementing a practical intervention with the NCERT Mathematics Kit, this research offers data-driven insights into improving teaching methods to be more effective and centered around students.

1.3.0 Statement of the Problem

Many students of class VIII struggle with mathematics due to traditional, rote-based teaching methods that fail to spark interest or develop understanding. Though the NCERT Mathematics Kit offers hands-on, activity-based learning, its impact on students' attitude, interest, and achievement has not been fully explored. This study aims to examine how effectively using this kit can improve learning outcomes in Mathematics. In light of the above, the present research seeks to investigate:

"A Study of the Effect of Teaching-learning through NCERT Mathematics Kit on Attitude, Interest, and Achievement in Mathematics of Class Eighth Students".

1.4.0 Definition of Key Terms

To ensure clarity and common understanding, the following key terms used in the study are defined:

1. NCERT Mathematics Kit:

   A set of teaching-learning resources and manipulatives, created by The National Council for Educational Research and Training (NCERT), to help middle and secondary school pupils understand mathematical concepts through hands-on activities.

2. Attitude toward Mathematics:

   The feelings, beliefs, and predispositions of students towards learning mathematics, which can be positive, negative, or neutral, influencing their motivation and engagement with the subject.

3. Interest in Mathematics:

   The level of curiosity, enjoyment, and sustained attention that a student shows toward mathematics activities and learning.

4. Academic Achievement in Mathematics:

   The measurable performance of students in mathematics, usually reflected through scores obtained in standardized tests or examinations designed to assess knowledge and skills in the subject.

5. Teaching-Learning Materials (TLMs):

   Physical or digital resources such as models, charts, kits, and aids used to support and enhance the teaching and learning process.

1.5.0 Objectives of the Study

The main objectives of the study are as follows:

1. To study the effect of teaching-learning through Mathematics kit on the Attitude towards Mathematics among class 8^{th} students by comparing attitude before and after Intervention.
2. To study the effect of teaching-learning through Mathematics kit on the Interest towards mathematics among class 8^{th} Students by comparing Interest before and after the Intervention.

3. To study the effect of teaching-learning through Mathematics kit on Achievement in Mathematics among class 8th class students by comparing Achievement before and after the Intervention.

1.6.0 Hypothesis of the Study

1. There is no significant difference in the Attitude towards Mathematics of class 8th students before and after being taught using Mathematics kit.

2. There is no significant difference in the Interest towards Mathematics of class 8th students before and after being taught using Mathematics kit.

3. There is no significant difference in the Achievement in Mathematics of class 8th before and after being taught through Mathematics kit.

1.7.0 Delimitation of the Study

The present study has been delimited in the following ways to maintain focus, feasibility, and clarity of investigation:

1. The study focuses exclusively on Class VIII students.
2. The subject of study is restricted to mathematics only.
3. Only the NCERT Mathematics Kit is used as the teaching-learning material; other kits or aids are excluded.
4. The duration of the intervention with the kit is limited to 21 days.
5. The study investigates only three variables: attitude, interest, and academic achievement in mathematics.
6. The study is conducted only in one school (DMS, Bhopal)

1.6.0 Conclusion

Overall, this chapter lays the foundation for exploring how the NCERT Mathematics Kit can enhance mathematics education by making it more engaging, meaningful, and effective for students in the critical middle school years. The following chapters will detail the research methodology, data analysis, and findings that aim to address these goals.

CHAPTER-2

REVIEW
OF
RELATED LITERATURE

Chapter 2
REVIEW OF RELATED LITERATURE

2.0 Prologue

The review of related literature helps the researcher to delimit and define the problem. It helps the researcher in avoiding unintentional duplication of well-established findings. It gives an understanding of the research methodology which refers to the way the study is to be conducted.

2.1 Introduction

The knowledge that has been gained throughout time as a consequence of on-going research is utilized in research. It can never be applied in isolation from previous research on issues that are either directly or indirectly related to a study that a researcher has proposed.

The objective of this section is to present a summary of the empirical research that supports the theoretical framework about mathematical achievement, interest in learning, and attitude toward mathematics. The literature has been thoroughly examined in order to analyze relevant studies, learn about prior research, and identify research gaps.

This chapter presents a review of national and international studies that explore the use of Mathematics kits, particularly the NCERT Mathematics Kit, and their impact on students' academic achievement, interest, and attitude towards Mathematics.

The objective of this review is to understand how previous researchers have approached similar problems, what methodologies they used, and what findings they reported. This will help in identifying the existing research gaps and situating the present study appropriately.

The studies reviewed have been classified under four headings:

- Studies related to Mathematics Kit and Teaching-Learning Material (TLM)
- Studies related to Achievement in Mathematics

- Studies related to Interest in Learning Mathematics
- Studies related to Attitude towards Mathematics

2.2 Reviews on Mathematics Kit and Teaching-Learning Material (TLM)

Gakhar and Neelam (2011) conducted a significant study titled *"Effectiveness of Activity-Based Learning in Mathematics at Elementary Level"* to examine how the integration of mathematics kits impacts learning outcomes. The research was hands-on, with one group learning through regular teaching methods and another group using kits from NCERT. The results showed that the group using the kits had a significant boost in understanding and learning results. Using physical tools like number discs, geometry models, and measuring instruments helped students learn from each other, get involved, and remember better. The study highly suggested that math kits should be included in everyday classroom teaching, along with training for teachers.

Rani and Singh (2018) conducted a study titled *"Influence of Activity-Based Learning Using Math Kit on Interest and Performance"* to examine how the use of a Math Kit impacted students' interest and academic achievement in mathematics. The research encompassed two Groups of students: one group received instruction through conventional teaching methods, while the other was engaged in activity-based learning utilizing the Math Kit. The results indicated that students who learned with the Math Kit exhibited markedly greater enthusiasm and superior performance in mathematics relative to their counterparts in the control group. The researchers deduced that Math Kits render abstract concepts more accessible and stimulating, fostering student involvement and enhancing conceptual comprehension, thereby establishing them as a valuable resource for advancing mathematics learning outcomes.

2.3 Studies related to Achievement in Mathematics

Agarwal, S. (2016): "*Effectiveness of Mathematics Kit in Enhancing Students' Achievement in Mathematics at Elementary Level".* Agarwal conducted an experimental study to assess the impact of using the NCERT Mathematics Kit on students' achievement in mathematics. The study involved 80 students from two government schools in Delhi, divided into control and experimental groups. The experimental group was taught using the Mathematics Kit, while the control group followed the traditional textbook method. The intervention lasted for four weeks. Pre-

test and post-test achievement scores were collected and analyzed using a t-test. The findings revealed that the experimental group significantly outperformed the control group in post-test scores, suggesting that the use of manipulatives and hands-on activities promoted better understanding and retention of mathematical concepts. Agarwal concluded that the mathematics kit helped bridge conceptual gaps by providing concrete experiences, thereby enhancing the overall achievement of students. The study emphasized the importance of contextual and activity-based teaching materials in mathematics classrooms.

Rani, M. & Singh, A. (2018): *"Influence of Activity-Based Learning Using Math Kit on Interest and Performance"* Rani and Singh conducted this study in the context of a government school in Haryana, involving 50 students from Grade 8. The research aimed to evaluate both the performance and interest levels of students when exposed to activity-based learning using a mathematics kit. The intervention consisted of teaching selected topics through activities aligned with the NCERT Mathematics Kit for two weeks. Pre- and post-tests were administered to measure academic performance, while an interest inventory was used to assess engagement. The research demonstrated a statistically significant enhancement in both achievement scores and levels of interest. Students exhibited favorable responses to hands-on learning methods, and the investigators observed that topics pertaining to geometry, mensuration, and fractions were comprehended more effectively. The authors advocated for the extensive incorporation of mathematics kits in educational settings, as these resources render mathematics more tangible and approachable.

Moyer, P.S. (2001): "Effects of Using Manipulatives on Middle School Students' Achievement" Moyer (2001) conducted a comprehensive study in the United States to investigate how the use of manipulatives—tangible objects like blocks, counters, and geometric tools—impacts the academic achievement of middle school students in mathematics. Achievement assessments were conducted prior to and following the intervention to assess progress. The findings indicated a statistically significant improvement in the average scores of the experimental group in comparison to the control group Moyer noted that students utilizing manipulatives exhibited a superior conceptual understanding and greater confidence in addressing abstract mathematical challenges. The interactive activities facilitated a connection between tangible

experiences and abstract reasoning, thereby rendering mathematics more relevant. The research concluded that manipulatives are effective instructional tools that can improve both conceptual understanding and procedural skills when incorporated appropriately into teaching practices. Moyer recommended their consistent application, particularly in middle school settings, where students start to shift from fundamental arithmetic to more advanced mathematical reasoning.

Das and Roy (2014) investigated the impact of mathematics laboratory activities on student achievement. In their study, an experimental group received instruction using hands-on math lab activities, while a control group followed traditional textbook teaching. The activities involved models, manipulatives, and problem-solving tasks to enhance conceptual understanding.

After six weeks of intervention, results showed that students taught through lab-based activities performed significantly better in post-tests compared to the control group. The study concluded that mathematics labs improve student engagement and conceptual clarity, ultimately boosting academic achievement. The researchers advocated for regular integration of lab activities into classroom teaching for more effective learning outcomes

2.4 Studies related to Interest in Learning Mathematics

Singh, R. & Mishra, S. *(2017): "Effect of Mathematics Kit on Students' Interest in Learning Mathematics" (India). It* examined how the use of a mathematics kit influenced students' interest in learning the subject. The study employed a quasi-experimental design where one group of middle school students was taught mathematics using the kit, while the control group followed the traditional method. The mathematics kit comprised a range of interactive tools and activities that were in accordance with the curriculum. The results indicated that students participating in the experimental group exhibited a significantly greater interest in mathematics following the intervention. The researchers determined that the integration of mathematics kits into standard classroom teaching can greatly improve students' enthusiasm and motivation for learning mathematics, thereby rendering abstract concepts more tangible and enjoyable.

Gupta, P. & Sharma, R. (2015): *"Enhancing Mathematical Interest through Activity-Based Learning"* (India). It investigated the impact of activity-based learning on students' interest in mathematics among upper primary learners. The research concentrated on implementing a range of interactive classroom activities, such as games, puzzles, role-playing, and practical problem-solving situations. The experimental group participated in these engaging methods, whereas the control group was subjected to traditional textbook instruction. By employing an interest inventory scale both prior to and following the intervention; the researchers noted a marked enhancement in the interest levels of students who engaged with the activity-oriented approach. The findings underscored that when students are afforded the chance to actively interact with mathematical concepts through enjoyable and relevant tasks, their curiosity and favorable attitudes towards the subject significantly improve.

Kaur and Bansal (2017) conducted a study to explore how the use of the NCERT Mathematics Kit influences the interest levels of middle school students in mathematics. The research employed a quasi-experimental design with two groups—one taught using the Math Kit and the other through traditional methods. The tools included an Interest Inventory Scale administered both pre and post-intervention. Findings revealed that students in the experimental group exhibited a marked improvement in their interest towards learning mathematics. The use of physical, hands-on teaching aids, such as geometrical models, fraction discs, and measurement tools, allowed students to visualize abstract concepts and engage more deeply with the subject. The study concluded that the Mathematics Kit serves as an effective pedagogical tool for cultivating interest and overcoming the fear and monotony often associated with mathematics learning.

2.5 Reviews related to Attitude towards Mathematics

Joseph, B. & Thomas, L. (2015) (India) *"Role of Teaching Learning Material (TLM) in Enhancing Students' Attitude in Mathematics"* This study conducted by Joseph and Thomas (2015) focused on the role of Teaching Learning Material (TLM) in improving students' attitudes towards mathematics at the upper primary level in Kerala, India. The researchers employed a quasi-experimental design involving two groups of students: one exposed to mathematics instruction integrated with TLM and another taught through traditional methods. The teaching and learning materials (TLMs) included

hands-on tools like manipulatives, charts, flashcards, and math kits that encouraged active participation. The results showed that students who learned with TLMs had a much more favorable attitude towards mathematics compared to those who did not. The study highlighted that using relevant and contextual TLM made abstract concepts easier to understand, lessened math anxiety, and increased student involvement. It concluded that making math instruction more visual, tangible, and interactive fosters greater interest, confidence, and a positive outlook on the subject.

Carbonneau, K.J., Marley, S.C., & Selig, J.P. (2013) – Meta-analysis. This meta-analysis examined the impact of using manipulatives on students' attitudes towards mathematics across multiple studies. The findings revealed that the use of concrete instructional materials significantly improved students' emotional responses to mathematics, making them more confident and interested in the subject. The analysis emphasized that manipulatives help bridge abstract concepts with tangible understanding, particularly benefiting younger and struggling learners. The findings revealed that students exposed to activity-based learning showed significantly more positive attitudes towards mathematics compared to those in the traditional setup. The study concluded that well-integrated manipulative use fosters a more positive attitude towards mathematics when paired with clear instructional guidance. This research supports the broader pedagogical shift toward constructivist approaches in mathematics education, where active learning and student-centered strategies are prioritized to foster both conceptual understanding and positive emotional responses to the subject.

Chaurasia (2014) conducted a study to investigate the effectiveness of activity-based teaching methods in enhancing students' attitudes toward mathematics. The study was carried out among upper primary school students in India, using an experimental design with a control and an experimental group. The experimental group learned mathematics through activity-based and student-focused methods, while the control group participated in traditional lecture-style instruction. The results indicated that students engaged in activity-based learning demonstrated notably more favorable attitudes toward mathematics compared to those in the conventional setup. These students displayed increased interest, motivation, and involvement in grasping mathematical concepts. Chaurasia concluded that utilizing manipulatives, real-world examples, collaborative activities, and interactive resources contributed to lowering anxiety and

made mathematics more enjoyable and relevant. This research strongly advocates for the incorporation of innovative teaching tools, like the NCERT Mathematics Toolkit, to cultivate a more positive learning atmosphere and encourage favorable attitudes among students.

2.4 Summary of Related Studies

The following table provides a summary of key research studies related to the use of Mathematics kits or activity-based tools in Mathematics education. It outlines the research titles, the researchers involved, and the major findings relevant to the current study.

Table 2.1 Table showing Summary of Reviewed Literature on Related Studies

S. No.	Topic/Research Title	Researchers	Major Findings
1	Effectiveness of Mathematics Kit on Academic Achievement of Secondary School Students	Sharma, R. & Mehta, P. (2017) *(India)*	Use of the Mathematics kit significantly improved students' academic performance and conceptual clarity in mathematics.
2	Impact of Teaching Aids on Students' Attitude Towards Mathematics	Kumar, S. (2016) *(India)*	Students taught with teaching aids including the math kit showed a more positive attitude and reduced math anxiety.
3	Influence of Activity-Based Learning Using Math Kit on Interest and Performance	Rani, M. & Singh, A. (2018) *(India)*	Activity-based learning using the NCERT math kit increased students' interest and engagement, leading to better learning outcomes.
4	Effect of NCERT Mathematics Kit on Learning Outcomes of Class X Students	Ahmed, I. & Fatima, S. (2019) *(India)*	Mathematics kits helped bridge the gap in understanding abstract concepts, resulting in higher achievement levels.
5	Role of Teaching Learning Material (TLM) in Enhancing Students' Attitude in Mathematics	Joseph, B. & Thomas, L. (2015) *(India)*	TLMs, especially the NCERT mathematics kit, improved learners' confidence and built a positive perception towards mathematics.
6	Enhancing Mathematical Skills Through Interactive Kits	Nair, R. & Menon, A. (2018) *(India)*	Interactive use of kits enhanced problem-solving skills and motivated students to explore mathematics beyond textbooks.
7	An Evaluation of the Impact of Mathematics Laboratory Activities on Student Achievement	Das, P. & Roy, T. (2014) *(India)*	Regular lab activities using math kits showed a direct correlation with improved achievement and enthusiasm for learning math.

8	Math Kits as a Pedagogical Tool: A Case Study in Government Schools	Chatterjee, N. (2022) *(India)*	Math kits served as an effective pedagogical tool in under-resourced schools, improving students' mathematical understanding and reducing fear of the subject.
9	Manipulative Materials as Tools for Teaching Mathematics	Sowell, E.J. (1989) *(USA)*	Found that students who used manipulatives for instruction performed better and retained concepts longer than those with traditional methods.
10	Effects of Using Manipulatives on Middle School Students' Achievement	Moyer, P.S. (2001) *(USA)*	Use of hands-on math manipulatives led to improved understanding of mathematical structures and increased student engagement.
11	Use of Mathematics Kits in Developing Countries	UNESCO Report (2016) *(Global)*	Recommended use of low-cost, activity-based math kits to improve basic math competencies, especially in underserved areas.
12	Impact of Manipulative Use on Student Attitudes Towards Mathematics	Carbonneau, K.J., Marley, S.C., & Selig, J.P. (2013) *(Meta-analysis)*	Found that students who used manipulatives showed more positive attitudes and better conceptual learning across multiple international studies.

2.7 Conclusion

The reviewed studies collectively highlight the positive impact of Mathematics kits—particularly the NCERT Mathematics kit—on students' academic achievement, interest, and attitude toward Mathematics. Most studies report that activity-based and hands-on learning experiences using such kits lead to improved conceptual understanding, reduced anxiety, enhanced interest, and better performance in Mathematics. Many researchers found that when students use hands-on materials like the NCERT Mathematics kit, they show better results in exams, develop a positive attitude towards Mathematics, and enjoy learning more. These tools are especially effective in bridging learning gaps in under-resourced and making abstract concepts more accessible through concrete manipulation.

2.8 Research Gap

Even though many national and international studies have shown that Mathematics kits and hands-on materials help students learn better, there are still some important

areas that have not been explored enough. These unexplored areas are called research gaps. Identifying these gaps helps to understand why the present study is needed and how it will add something new to the existing knowledge.

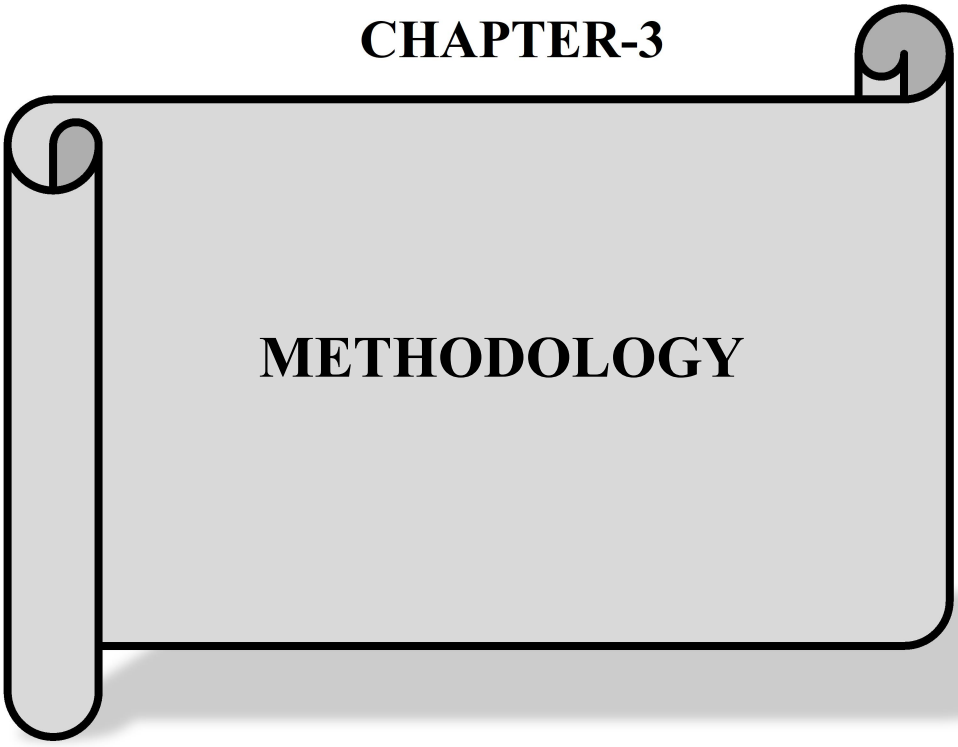
In this study, the focus is on using the NCERT Mathematics Kit to improve attitude, interest, and achievement in Mathematics among Class 8 students. A close look at the existing studies shows that most of them focus on primary or secondary levels, use general teaching aids, or focus on only one or two aspects (either achievement or attitude). There is very little research that connects all three areas-attitude, interest, and achievement—especially using the NCERT kit urban government schools.

Some areas where more research is needed:

- **NCERT Math Kit Not Studied Separately:**
  Many studies talk about teaching aids or manipulatives in general. Only a few focus specifically on the NCERT Mathematics Kit, which is used in government schools in India.
- **Lack of Studies on Class 8 Students:**
  Most studies focus on either primary school (lower classes) or high school (Class 9 or 10). Very few have been done with Class 8 students.
- **Less Research in Urban or Semi-Urban Government Schools:**
  Most research is either in rural areas or private schools. We need more research in **urban and semi-urban government schools** where the learning environment is different.
- **Limited Use of Pre-Test and Post-Test with Attitude Scales:**
  Many studies do not use attitude and interest scales to measure changes before and after using the kit.

This creates a strong need for the present study, which aims to fill this gap by examining the impact of the NCERT Mathematics kit on Class 8 students. By focusing on these three aspects together in urban context, the study will provide new insights and support better teaching practices in Mathematics education

CHAPTER-3



METHODOLOGY

Chapter 3

METHODOLOGY

3.0.0 Prologue

Research design is a comprehensive plan of action that a researcher intends to carry out to achieve pre-decided objectives. Research design comprises of Procedure, Methodology, Variables, Sample, Selection and development of Tools and Statistical techniques applied in the study. Procedure of the study is of the prime importance in attacking any research problem in a scientific way without an appropriate planning; the difficulties that are to be encountered during the process of work cannot be anticipated or solved. This chapter deals with methodology employed in order to achieve different objectives and to verify hypotheses of the study. It deals with sampling procedures, design, and the tools used, details on collection of data and statistical techniques employed for analysis and interpretation of the data. . The clear and systematic statements of the procedure avoid all the difficulties in the research and help the researcher to achieve the desired aims and objectives of the study. The present chapter is a description of the actual procedure followed by the researcher in order to collect the data, analyze and draw conclusions.

3.1.0 Introduction

Methodology of research specifically involved the method followed in the process of research starting from the identification of the problem till the statistical techniques used to arrive at appropriate conclusions. The present study entitled "A Study of the Effect of teaching-learning through NCERT Mathematics kit on Attitude, Interest and Achievement in Mathematics of class Eighth Students" followed the quasi-experimental method. The details of the Methodology and Procedure followed are discussed in the following paragraphs.

3.2.0 Method of the study

Method of the study generally depends upon the nature of the problem of research. It is a systematic approach towards a particular phenomenon. In the study, the researcher attempts to select the most appropriate method to the particular problem under consideration. The present study employs a quantitative research approach using a quasi-experimental method with a single-group pretest-posttest design.

3.2.1 Design of the Study

The selection of the research design is so important step in research process like an architect's plan for making the structure of a building. It has been considered as blue print of the procedure that enable the researcher to test hypothesis by reaching valid conclusions to establish the relationship between dependent and independent variables.

The present study adopts a quasi-experimental research design, specifically the single-group pretest-posttest design, to examine the impact of the NCERT Mathematics Kit on the attitude, interest, and achievement in mathematics of Class VIII students. In this design, a single group of participants is assessed twice—once before the intervention (pre-test) and once after the intervention (post-test), to determine any changes resulting from the intervention. The pre-test provides a baseline measure of students' existing levels of attitude, interest, and academic performance in mathematics, while the post-test captures the same variables after exposure to the mathematics kit. The absence of a control group limits causal inferences, but this design remains effective for exploring the direction and magnitude of change within the same group. The study is implemented in a natural classroom setting where all students receive the intervention as part of their regular instructional activities, ensuring ecological validity. Standardized tools were used to assess students' attitude, interest, and achievement in mathematics. The NCERT Mathematics Kit was used as the intervention over a defined period during regular mathematics instruction Data collected at both time points are analyzed using appropriate statistical methods, such as the paired sample t-test, to assess the significance of the observed differences. This design is suitable for evaluating educational innovations where random assignment is not feasible, yet there is a clear interest in measuring the outcomes of a specific instructional tool or strategy.

3.2.2 Research Design

The research design used in this study is given below

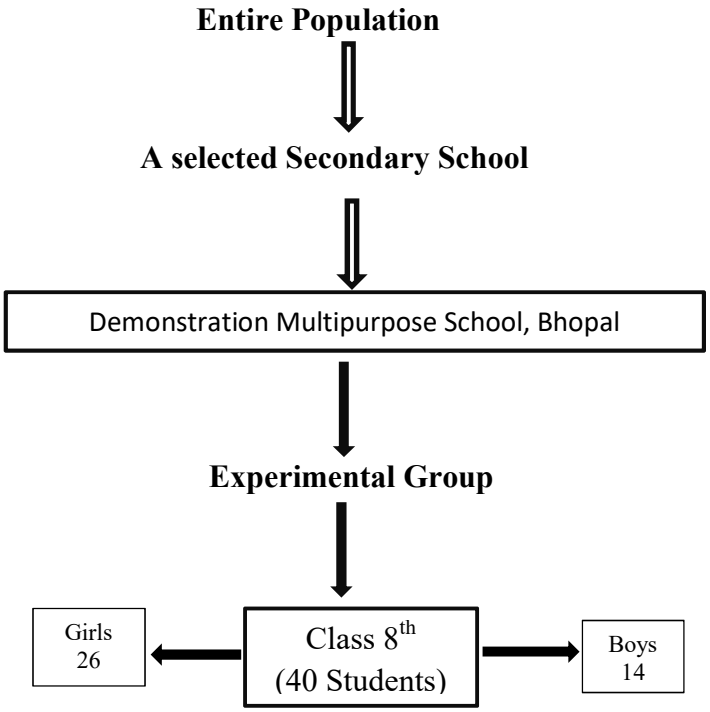
Table 3.1: Research Design – Diagrammatic Representation

Phase I	1. Selection of variable 2. Selection of the study 3. Preparation of the tool to measure the selected variable
Phase II	1. Selecting the experimental group 2. Administration of the pre-test 3. Treatment-Teaching selected contents in Mathematics using Mathematics 4. Administration of the post test
Phase III	1. Analysis of the data using suitable statistical procedures 2. Writing the report.

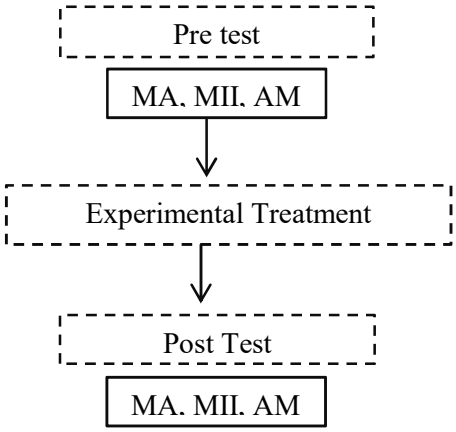
Table 3.2: Schematic Representation of the Experimental Procedure

Levels	Experimental Group
Pre-test	The administration of the "Achievement in Mathematics" constructed by the investigator based on the topics considered for the experiment, a standardised scale on "Attitude towards Mathematics" and a standardized test on "Mathematics Interest Inventory"
Treatment	Teaching Mathematics using NCERT based Mathematics kit (Designing a lesson plan and delivering instruction)
Post-test	The administration of the "Achievement in Mathematics" constructed by the investigator based on the topics considered for the experiment, a standardised scale on "Attitude towards Mathematics" and a standardized test on "Mathematics Interest Inventory

Fig. 3.1 Diagrammatic Representation of Sampling Procedure



Representation of the Experimental Design



MA*Mathematics Attitude Scale, MII* Mathematics Interest Inventory, AM* Achievement test in Mathematics

3.3.0 Variables

Every research study is based on the identification and analysis of specific variables that play a critical role in achieving the objectives of the study. In this study, there are two main types of variables: the independent variable and the dependent variables**.**

3.3.1 Independent variable

The independent variable is the use of the NCERT Mathematics Kit. It is the factor that was applied to bring about a change in the learning experience of the students. The NCERT Mathematics Kit, a well-organized collection of teaching and learning resources, was utilized to instruct Class VIII students on chosen mathematical concepts during a designated timeframe.

3.3.2 Dependent variable

Attitude towards Mathematics, Interest in Mathematics, and Achievement in Mathematics are the dependent variables.

Attitude towards Mathematics

In the present study, the development of Attitude towards Mathematics in students with Mathematics kit was considered. The Attitude towards Mathematics of students was measured using the standardised Attitude scale “Mathematics Attitude Scale” before and after the intervention.

Interest in Mathematics

In the present study, the development of Interest in Mathematics in students with Mathematics kit was considered. The Interest in Mathematics of students was measured using the standardised Interest Inventory “Mathematics Interest Inventory”.

Achievement in Mathematics

Achievement in Mathematics is score gained by an individual for the given test. This variable indicates the students' performance in mathematics, assessed through a teacher-created achievement test aligned with the curriculum and material

covered during the intervention. The Achievement in Mathematics was measured using the Achievement Test.

3.4.0 Population and Sample of the Study

The students of class 8th studying in Demonstration Multipurpose School, Bhopal formed the Population of the study. These students formed the experimental group and were taught selected mathematics topics using the NCERT Mathematics Kit. There was **no separate selection or division** of students within the class. All 40 students formed the **experimental group** and were involved in both the pre-test and post-test process. English was the medium of instruction and included both Girls and Boys. The performance of the same group was compared to understand the effect of the intervention in a natural classroom setting.

3.5.0 Tools used for Data Collection

The aim of this investigation was to study the effect of NCERT Mathematics kit on mathematical achievement, interest in learning mathematics and attitude towards mathematics among class 8th students. In view of this study, some standardized tools were used for collection of data. The details of the tools selected and developed are presented in the following table 3.3

Table 3.2 Details of Tools used for the Study

S.No.	Name of the Tool	Developed by
1.	Attitude towards Mathematics	Ali Imam and Tahira Khatoon
2.	Mathematics Interest Inventory	L.N. Dubey
3.	Achievement Test in Mathematics	Self-made Achievement test

3.6.0 Description of the tools used for the study

3.6.1 Mathematics Attitude scale (MAS)

Ali Imam and Tahira Khatoon developed and standardized this scale in 2002. The components are Usefulness of mathematics, Confidence in mathematics and enjoyment of mathematics. The time limit of the test was 20 minutes and five point Likert scale

procedure is in nature. Mathematics Attitude scale (MAS) consists 22 item. This scale is used to measure the attitude of students of secondary, senior secondary and university level as well as the school and university teachers towards mathematics.

Table 3.1 Table showing Scoring System in Attitude scale

Response	Positive Items	Negative Items (Reverse Scored)
Strongly Agree (SA)	**5**	**1**
Agree (A)	**4**	**2**
Undecided (UD)	**3**	**3**
Disagree (D)	**2**	**4**
Strongly Disagree (SD)	**1**	**5**

- **Scoring Range**

  Minimum Score: 22
  Maximum Score: 110

- **Interpretation**

  Higher total scores indicate a more positive attitude towards mathematics.
  Lower scores suggest a negative or less favorable attitude.

3.6.2 Mathematics Interest Inventory

The Mathematics Interest Inventory, developed by **L.N. Dubey**, is a standardized tool designed to assess students' interest in the subject of Mathematics. It consists of 40 items, equally divided into:

- 20 positive (liking) statements
- 20 negative (disliking) statements

Each statement reflects either a favorable or unfavorable attitude toward Mathematics. The students are required to respond to each item by marking either **'Yes'** or **'No'**

The inventory includes both positive and negative statements to assess students' feelings towards learning mathematics. This tool is used to find out how much students are interested in mathematics and how positively or negatively they feel about learning the subject. These answers aid in assessing their level of interest in a number of topics, including their perception of the usefulness of mathematics, their emotional reaction to

mathematical tasks, their engagement in class activities, and their enjoyment of problem-solving.

Table 3.2 Table showing scoring system of Mathematics Inventory

Response Type	Positive Items (20)	Negative Items (20)	Total Possible Score
Yes	1 point	0 point	
No	0 point	1 point	
Max Total	20	20	**40**

3.6.3 Mathematics Achievement test

The Achievement Test was self-made by the investigator to measure the Achievement in Mathematics. The Achievement test was constructed keeping in mind the objectives, such as knowledge, understanding, application and skill of the students. The text book prescribed by the CBSE was used in the construction of the test.

The test comprised of 30 marks with a mix of easy, medium, and hard questions to assess different thinking skills. It included multiple-choice questions and short-answer questions focused on concepts, allowing for both objective evaluation and comprehension of math concepts. The same test was given before and after the intervention with the NCERT Mathematics Kit to see how much students improved in math after using hands-on learning activities.

3.7.0 Procedure of Data Collection

The researcher carries out the experiment in DMS, Bhopal. The procedure in which the present study was carried out comprised of three levels.

3.7.1 Administration of Pre-Test

Pre-test was conducted on the experimental group (Class 8^{th} students) using "Mathematics Attitude Scale", "Mathematics Interest Inventory, and "Achievement test in Mathematics". Pre-tests were administered at the same time. Every student was given a separate answer sheet to record the responses. At the end answer sheets were collected.

3.7.2 Experimental Treatment

The treatment consisted of three weeks. Students were taught through NCERT Mathematics kit as per class 8th manual. The representation of the experimental design is given in Table 3.2.

3.7.3 Administration of Post-Test

After giving the treatment, the administration of "Mathematics Attitude Scale", "Mathematics Interest Inventory, and "Achievement test in Mathematics" was conducted. Every student was given a separate answer sheet to record the responses. After the administration the answer sheets were collected from the experimental Group.

3.8.0 Statistical Techniques used for Data Analysis

The pre-test, and post-test answer sheets obtained from the students were scored as per the guidelines and scoring keys of each test. These obtained scores were tabulated and were computed. These scores were considered as raw scores for further statistical analysis.

In the present study, the data collected were analysed quantitatively, which include descriptive statistics and inferential statistics.

3.8.1 Descriptive Statistics

Descriptive Statistics are those methods which are employed to describe what has been observed by the investigator. Descriptive Statistics namely Mean and Standard Deviation were computed and Bar graphs were plotted for the various variables of the study.

3.8.2 Inferential Statistics

The following inferential techniques were used to analyze the collected data with a view to test the hypotheses

't' test: Used to compare the mean scores of pre-test and post-test to check if the difference in students' interest and attitude was statistically significant after the intervention.

CHAPTER-4

DATA ANALYSIS AND INTERPRETATION

Chapter 4

DATA ANALYSIS AND INTERPRETATION

4.0.0 Prologue

In the previous chapter the methodology adopted for the study was presented. The present chapter is devoted to analysis and interpretation of data.

Data analysis is the most important phase in any research process. It is considered to be important step and heart of the research in research work. Data is collected and analysed to answer questions, test hypotheses or disprove theories. Data analysis summarizes collected data. It is the process of systematically applying statistical techniques and logical reasoning to explain, illustrate, summarize, revise, inspect, evaluate, transform, and remodel the data, with a view to reach a certain conclusion for a given situation or a problem. It provides a meaningful base to crucial decisions. The researcher studies the collected data from different angles and explores new facts. Once the analysis has been made, the researcher proceeds to the stage of interpretation of results. Interpretation needs careful, logical and critical examination of the results obtained from the analysis. Each section of the analysis has been supported with tables and graphs for better understanding and visualization.

This chapter analyses and interprets the data related to different objectives of the present study using Quantitative data analysis which is associated with finding evidence to either support or reject the hypotheses and also the conclusions are drawn. The analysis aims to assess if there is a notable difference in students' responses before and after the intervention, as well as to evaluate how much the mathematics kit impacted their motivation and understanding of mathematical concepts. The details of the testing of hypotheses and their interpretation would be discussed in the following pages.

This chapter ultimately provides the foundation for discussion, conclusions.

4.1.0 Objective: "To study the effect of teaching-learning through Mathematics kit on the Attitude towards Mathematics among class 8th students by comparing attitude before and after Intervention".

To achieve above objective, data was collected through a standardized tool—Attitude Scale in Mathematics developed by Dr. Ali Imam and Dr. Tahira Khatoon. The scale is a well-validated instrument consisting of statements related to various dimensions of students' attitude. The interpretation of the data was done using descriptive statistics, which includes Mean, Standard Deviation, and graphical representation which has been presented in tables and figures. The inferential statistics't' test was used.

4.1.1 Analysis and Interpretation of Objective using Descriptive Statistics

The descriptive statistics used for analysis and interpretation of objective one includes mean, standard deviation and graphical representation, which has been presented in the form of table and figure.

Table 4.1: Mean of Pre-test and Post-test Attitude Scores of the students towards Mathematics

Tests	N	Mean	S.D.
Pre-test	40	66.85	5.08
Post-test	40	79.75	5.09

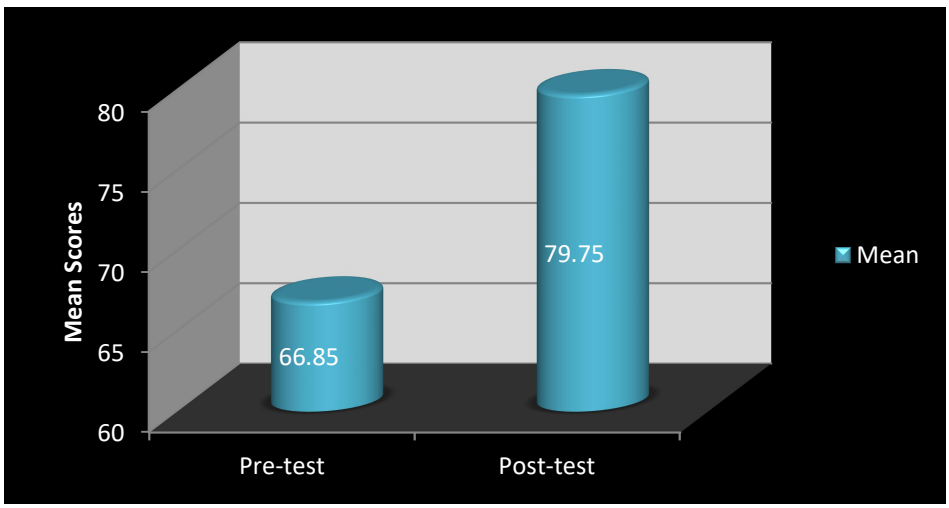


Figure 4.1: Graph Representing the Pre-test and Post-test Attitude Scores of the students towards Mathematics

From the Table 4.1 and Figure 4.1 it is observed that the mean scores of students on Attitude towards Mathematics are higher in Post-test than Pre-test score.

This shows that students has performed better in Post-test than Pre-test. The height difference between two bars shows the difference between the scores before and after the Intervention. The significance of the difference was tested using the inferential statistics.

4.1.2 Analysis and Interpretation of Objective using Inferential Statistics

A null hypothesis was formulated in relation to objective. Inferential statistics was used to analyze and interpret the null hypothesis. The‘t’ value was calculated to find out the significant difference in the effect of using Mathematics kit on Attitude towards Mathematics among the students of class 8^{th}. In order to test the null hypothesis H_0 a hypothesis is formulated as given below:

H_0: There is no significant difference in the Attitude towards Mathematics of class 8^{th} students before and after being taught using Mathematics kit

The‘t’ test was used to test the null hypothesis and the results are given in table 4.2

Table 4.2:‘t’ Test Details of the Pre-test and Post-test Attitude Scores of the students towards Mathematics

Tests	N	Mean	S.D.	‘t” value	df	Level of significance
Pre-test	40	66.85	5.08	11.35	39	Significant at 0.05 level
Post-test	40	79.75	5.09			

From the Table 4.2 it is observed that the obtained‘t’ value is 11.35 which is more than the theoretical value 2.02 with degree of freedom 39 at 0.05 level of significance. Hence the null hypothesis was rejected. i.e. There is significant difference in the Attitude towards Mathematics of class 8^{th} students before and after being taught using

Mathematics kit. Further as the mean of the Pre-test Attitude Score is 66.85 and the mean of the Post-test Attitude Score is 79.75, the difference is in favour of the Post-test Attitude Score of Students. Hence it can be concluded that the Attitude towards Mathematics among students is higher in Post-test than Pre-test after the Intervention.

4.1.3 Conclusion

The present study shows that students have developed significantly high positive Attitude towards Mathematics before and after the Intervention. Therefore, from the above result it can be concluded that, Mathematics kit based learning is effective in developing Attitude towards Mathematics among the Students of class 8th.

4.2.0 Objective: "To study the effect of teaching-learning through Mathematics kit on the Interest towards mathematics among class 8th Students by comparing Interest before and after the Intervention".

To achieve above objective, data was collected through a standardized tool- the Mathematics Interest Inventory Test developed by L.N. Dubey was used as a standardized tool. The inventory consists of a series of items designed to measure different aspects of interest. The interpretation of the data was done using descriptive statistics, which includes Mean, Standard Deviation, and graphical representation which has been presented in the form of table and graph.

4.2.1 Analysis and Interpretation of Objective using Descriptive Statistics

The descriptive statistics used for analysis and interpretation of objective two includes mean, standard deviation and graphical representation, which has been presented in the form of table and figure.

Table 4.3: Mean of pre-test & post-test score of the students on Interest towards Mathematics

Tests	N	Mean	S.D.
Pre-test	40	23.85	3.641
Post-test	40	28.95	2.669

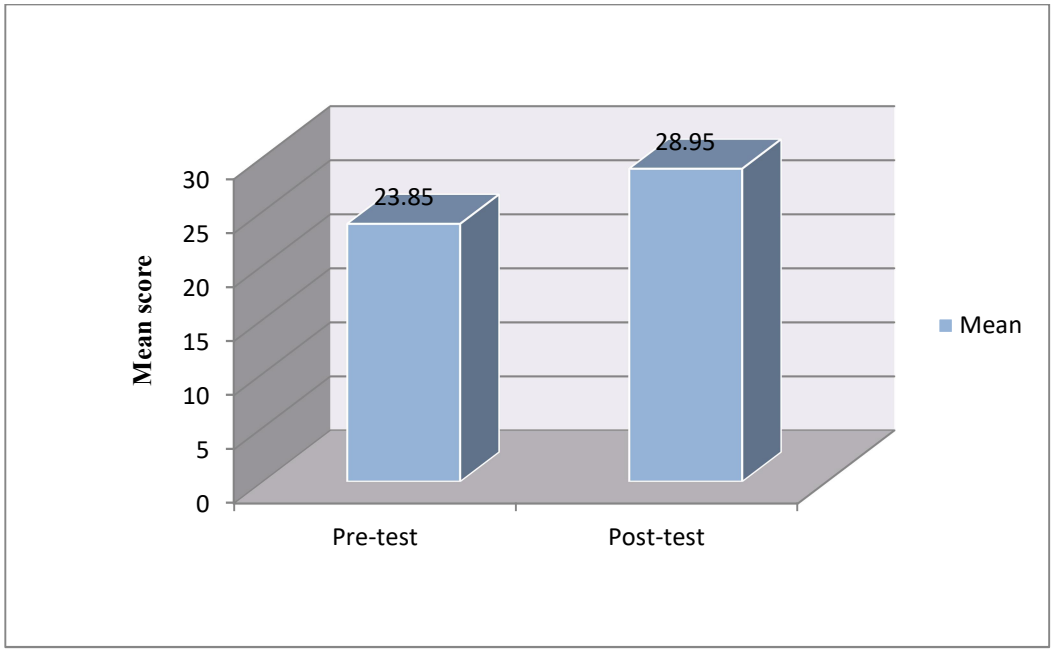


Figure 4.2: Graph Representing the Mean scores of students on Interest towards Mathematics

From the Table 4.3 and Figure 4.2 it is observed that the mean scores of Interest towards Mathematics of class 8th students are higher than in post-test scores as compared to pre-test scores.

This shows that students has performed better in post-test score than in pre-test score. The height difference between two bars shows the difference between the scores. The significance of the difference was tested using the inferential statistics.

4.2.2 Analysis and Interpretation of Objective using Inferential Statistics

A null hypothesis was formulated in relation to objective. Inferential statistics was used to analyze and interpret the null hypothesis. The‘t’ value was calculated to find out the significant difference in the effect of using Mathematics kit on the Interest in Mathematics among the students of Standard Eight. In order to test the null hypothesis $\mathbf{H_0}$, an hypothesis was formulated as given below.

H_0: There is no significant difference in the Interest towards Mathematics of class 8th students before and after being taught using Mathematics kit.

The‘t’ test was used to test the null hypothesis and the results are given in Table 4.4

Table 4.4:'t' Test Detail of the Pre-test and Post-test scores of the students on Interest towards Mathematics

Test	N	Mean	S.D.	df	t	Result
Pre-test	40	23.85	3.641	39	10.206	Significant at 0.05 level
Post-test	40	28.95	2.669			

From the Table 4.4 it is observed that the obtained't' value is 10.206 which is more than the theoretical value 2.02. Hence the null hypothesis was rejected. i.e. There is significant difference in the Interest towards Mathematics of class 8th students before and after being taught using Mathematics kit Further as the mean of the pre-test is 23.85 and the mean of the post-test is 28.95, the difference is in favour of the post-test mean scores of the students. Hence it can be concluded that the Interest towards Mathematics among of students is higher in post-test score than pre-test scores.

Conclusion

The present study shows that the students has performed better in post-test as compared to pre-test before and after the intervention. Therefore, from the above result it can be concluded that, NCERT Mathematics kit has significantly improved Interest towards Mathematics among class 8th students.

4.3.0 Objective: "To study the effect of teaching-learning through Mathematics kit on Achievement in Mathematics among class 8th class students by comparing Achievement before and after the Intervention".

To achieve above objective, data was collected through a self-made Achievement Test in Mathematics developed by the researcher. The test was designed in alignment with the topics covered during the intervention**.** The interpretation of the data was done using descriptive statistics, which includes Mean, Standard Deviation, and graphical representation which has been presented in the form of table and graph.

4.3.1 Analysis and Interpretation of Objective using Descriptive Statistics

The descriptive statistics used for analysis and interpretation of objective three includes mean, standard deviation and graphical representation, which has been presented in the form of table and figure

Table 4.5: Mean of Pre-test and Post-test scores on the Achievement in Mathematics of the students

Test	N	MM	Mean	S.D.
Pre-test	40	30	17.35	2.9
Post-test	40	30	22.28	3.0

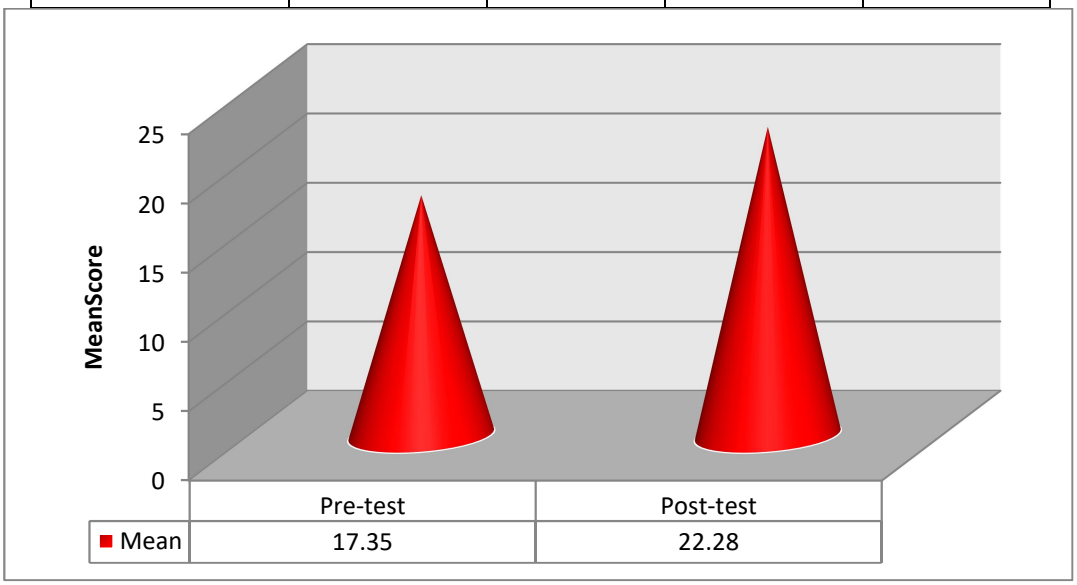


Figure 4.3: Graph Representing Mean of Pre-test and Post-test score on the Achievement in Mathematics of the students

From the Table 4.5 and Figure 4.3 it is observed that the mean scores on Achievement in Mathematics are higher in Post-test than Pre-test scores of the students.

This shows that students has performed better in Post-test than Pre-test. The height difference between two bars shows the difference between the mean scores of the two tests. The significance of the difference was tested using the inferential statistics.

4.3.2 Analysis and Interpretation of Objective using Inferential Statistics

A null hypothesis was formulated in relation to objective. Inferential statistics was used to analyze and interpret the null hypothesis. The‘t’ value was calculated to find out the significant difference in the effect of Mathematics kit on Achievement in Mathematics among the students of class 8^{th}. In order to test the null hypothesis H_0, a hypothesis was formulated as given below.

H_0: There is no significant difference in the Achievement in Mathematics of class 8^{th} before and after being taught through Mathematics kit.

The‘t’ test was used to test the null hypothesis and the results are given in Table 4.6

Table 4.6:‘t’ test of the Pre-test and Post-test scores of the students on Achievement in Mathematics

Test	Mean	S.D.	df	t	Result
Pre-test	17.35	2.9	39	7.47	Significant at 0.05 level
Post-test	22.28	3			

From the Table 4.6 it is observed that the obtained‘t’ value 7.47 is greater than the theoretical value 2.02. Hence the null hypothesis was rejected. i.e. There is no significant difference in the Achievement in Mathematics of class 8^{th} before and after being taught through Mathematics kit. Further as the mean of the pre-test score is 17.35 and the mean of the post-test score is 22.28, the difference is in favour of post-test score of the students. Hence it can be concluded that the Achievement in Mathematics of students is higher in Post-test score than Pre-test Scores.

4.3.3 Conclusion

The present study shows that students have significantly improved their Achievement in Mathematics after the intervention. Therefore, from the above result it can be concluded that, Mathematics kit is effective on Achievement in Mathematics among the Students of class 8^{th}.

CHAPTER-5

SUMMARY, FINDINGS, EDUCATIONAL IMPLICATION AND SUGGESTIONS

Chapter 5

SUMMARY, FINDINGS, EDUCATIONAL IMPLICATION AND SUGGESTIONS

5.0.0 Prologue

The present chapter deals with the summary of the study along with the major findings and conclusions. It also gives recommendations on the basis of these findings, discusses the educational implication and suggestions for further research.

5.1.0 Summary

5.1.1 Overview of the Study

The study was designed to investigate whether the use of the NCERT Mathematics Kit in teaching Mathematics could bring a positive shift in students' Attitude, Interest, and Academic performance. The study was conducted on a single group of students from a central government school under RIE, Bhopal. The intervention consisted of teaching with the mathematics kit for a specific duration, and comparisons were made based on pre- and post-test results to assess the effect.

5.1.2 Objectives of the study

The main objective of the present study was to examine the impact of using the NCERT Mathematics Kit on students' attitude, interest, and achievement in mathematics. The researcher aimed to explore whether teaching with hands-on tools and activities could bring about significant improvement in learners' engagement and performance in the subject. The study sought to determine whether employing the mathematics kit in an activity-based learning environment may improve students' academic performance, boost their interest in the subject, and cultivate a more positive attitude toward mathematics. The researcher aimed to investigate whether learners may find abstract mathematical topics more tangible and significant through the use of interactive, captivating, and visual teaching aids.

5.1.3 Methodology Adopted

The study followed a pre-test and post-test experimental design. A group of 40 students from Demonstration Multipurpose School (DMS) under RIE, Bhopal, was selected for Experiment. The group was exposed to teaching with the NCERT Mathematics Kit, and their performance was assessed before and after the intervention. The experimental phase lasted for three weeks. During this period, a pre-test was conducted to assess the students' existing levels of attitude, interest, and achievement. Following this, the teaching intervention using the NCERT Mathematics Kit was implemented for 3weeks instructional days, after which a post-test was conducted to compare the gains and assess the impact of the treatment.

5.1.4 Variables of the Study

Keeping the objectives in view the following variables were considered for the study.

Independent Variables

In the present study, teaching approaches of mathematics are the independent variables.

1. Teaching mathematics with NCERT Mathematics kit

Dependent Variables

In the present study, dependent variables are

1. Mathematical achievement
2. Interest in learning mathematics
3. Attitude towards mathematics

5.1.5 Tools and Techniques Used

Three major tools were used in the study:

1. **Mathematics Interest Inventory** developed by B.N. Dubey, consisting of 40 items (20 positive and 20 negative statements) to assess students' interest level.
2. **Mathematics Attitude Scale** developed by Ali imam and Tahira, consisting of 22 items (11 positive and 11 negative statements) to assess students' Attitude towards Mathematics.
3. **Self-constructed Mathematics Achievement Test**, prepared by the researcher, which included a mix of multiple-choice, conceptual, and application-based

questions categorized into easy, moderate, and difficult levels, with a total of 30 marks.

5.1.6 Execution of the Experiment

The study followed a systematic procedure. In the first phase, the students were administered three separate pre-tests for attitude, interest, and achievement. These tests provided baseline data for comparison.

The second phase involved an intervention using the NCERT Mathematics Kit. Over the course of three weeks instructional days, selected mathematical concepts were taught using various components of the kit, such as geometrical models, measurement tools, algebraic devices, and manipulatives that allowed students to explore, experiment, and engage with mathematical ideas in a tactile and visual manner.

In the third phase, after the treatment period ended, the same pre-tests were re-administered to gather post-test data. This allowed for an accurate comparison of pre- and post-intervention performance and responses.

5.1.7 Statistical Method Used

For the analysis of data, inferential statistics were used. The t-test was applied to determine the significance of difference in means between pre-test and post-test scores for all three variables.

5.2.0 Major Findings of the Study

Major Findings of the Study were based on analysis of Post Test Scores are listed under this section.

5.2.1 Findings Related to Attitude towards Mathematics

- There is a significant difference between the mean scores of pre-test (66.85) and post-test (79.75) in the mathematical Attitude score of Students those class 8^{th} taught using NCERT Mathematics kit. The research found that the Mathematics Kit is an effective teaching-learning material in developing high positive Attitude towards mathematics among class 8^{th} students.

IMPACT

- Students showed a notable increase in attitude scores following the implementation of the NCERT Mathematics Kit.
- The interactive and hands-on nature of the kit contributed to a shift in perception, making mathematics appear more engaging and less stressful.

5.2.2 Findings Related to Interest in Learning Mathematics

- There is a significant difference between the mean scores of pre-test (23.85) and post-test (29.85) on Interest towards Mathematics of class 8^{th} students taught using NCERT Mathematics Kit. The research found that the Mathematics Kit is an effective teaching-learning material in developing Interest towards Mathematics among class 8^{th} students.

  IMPACT
- Students showed a marked increase in their interest levels after being taught with the help of the mathematics kit.
- The use of manipulatives, models, and visual aids fostered curiosity and excitement among learners.

5.2.3 Findings Related to Achievement in Mathematics

- There is a significant difference between the mean scores of pre-test (17.35) and post-test (22.28) in the Mathematical Achievement of class 8^{th} students taught using NCERT Mathematics Kit. The research found that the Mathematics Kit is an effective teaching-learning material to enhance Academic achievement in Mathematics among class 8^{th} students.

  IMPACT
- Students found it easier to grasp and remember math ideas when they learned using the kit-based approach.
- The activity-oriented teaching approach enhanced conceptual clarity and problem-solving skills.

5.3.0 Discussion and Conclusion of the Result

In the realm of education, a significant challenge is the rising incidence of failures in mathematics at both secondary and Higher secondary levels. Numerous factors contribute to the high failure rates observed in various examinations, with one prominent cause being ineffective teaching and learning strategies. In contemporary society, acquiring mathematical skills is essential for an individual's comprehensive development. Despite its relevance and significance, many students view mathematics as challenging, tedious, impractical, and abstract. Consequently, the persistent low achievement levels in mathematics among students have been observed. Various elements influence students' success in mathematics, one of which is their apprehension towards the subject. This mathematical anxiety is often rooted in negative attitudes towards mathematics and a lack of interest in the subject.

In recent years, using kits and teaching materials in math has become a popular and effective alternative to traditional teaching methods. Math, which students often find abstract and hard, can be made more tangible, interesting, and easier to understand with educational kits and hands-on tools. In the context of the present study, the use of the NCERT Mathematics Kit was examined to assess its impact on students' attitude, interest, and achievement in mathematics. The kit facilitated a deeper understanding of core concepts, supported differentiated learning styles, and made abstract content more understandable. This experiential mode of learning encouraged participation, retention, and self-confidence in problem-solving. The results of the study show that hands-on and experience-based learning methods work better than regular lectures. Using kits made learning more fun, engaging, and important for students. The results of the study show that hands-on and experience-based learning methods work better than regular lectures. Using kits made learning more fun, engaging, and meaningful for students.

As a result of this exposure, the experimental group showed a lot of improvement in their Mathematical Achievement, Interest in learning Mathematics and Attitude towards Mathematics. The results revealed that there was a significant difference in pre and post-test achievement test scores, interest in learning mathematics and attitude towards mathematics. Their success can be attributed to the teaching mathematics with the transitional background music approach.

Overall Impact of the NCERT Mathematics Kit:

- The comprehensive evaluation indicates that the NCERT Mathematics Kit had a beneficial effect on both the cognitive and emotional aspects of students
- Students not only improved academically but also developed a more favorable disposition toward the subject.
- The kit-based teaching method proved effective in making learning mathematics more meaningful and enjoyable.

5.4.0 Educational Implications

1. The experiment conducted by the researcher reveals that teaching Mathematics with NCERT Mathematics Kit is significantly more effective in developing Attitude towards Mathematics among Secondary school students. Therefore the schools can adopt the Mathematics kit approach in Mathematics teaching for the development of Attitude towards Mathematics.

2. It was found that the teaching mathematics with NCERT Mathematics Kit is significantly more effective in developing Interest in learning Mathematics among Secondary school students. Therefore the schools can adopt Mathematics kit approach in Mathematics teaching for the development of Interest in learning mathematics.

3. It was found that the teaching mathematics with NCERT Mathematics Kit is significantly more effective in developing Academic achievement in Mathematics among Secondary school students. Therefore the schools can adopt Mathematics kit approach in Mathematics for improving the academic achievement in mathematics.

4. Mathematics kit was equally effective for both boys and girls in developing Attitude towards mathematics and Interest in learning mathematics. Hence, boys and girls need not be segregated in the classroom on the basis of their gender in fostering the attitude towards the mathematics and interest in learning mathematics.

5. The mathematics teachers working in secondary school level can make use of the mathematics kit in their classroom to attract the students towards the subject.

6. The kit helps teachers turn textbook activities into real classroom experiences. Instead of just explaining concepts, teachers can use the kit to make visual and hands-on models, allowing students to see and interact with objects that relate to what they are

learning. This approach enhances understanding, keeps students engaged, and clarifies concepts.

7. The kit promotes inclusive education by accommodating students with different abilities and learning preferences. It fosters peer discussions, collaborative work, and active engagement, turning math classrooms into lively and enjoyable learning environments. This approach is particularly effective in alleviating math anxiety among learners.

5.5.0 Suggestions for the further study

Followings could be the suggestions for the further researchers related to the present study.

- Students from different classes can be involved in research to evaluate the kit's effectiveness across various learning levels.
- Future studies could explore combining the Mathematics Kit with digital tools to enhance learning.
- This study can be further extended by involving more different variables like Self-awareness, problem solving ability, decision making etc.
- A comparative study can be done to know the difference between its impact on government and private school students.
- Research can examine how effectively training teachers to use the kit impacts students' learning.
- Researchers can evaluate the effectiveness of the kit in teaching subjects such as geometry, algebra, or fractions.
- Further studies can also examine how the kit transforms the classroom, enhancing collaboration, engagement, and interaction between students and teachers.

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APPENDICES

A. Mathematics Attitude Scale
B. Mathematics Interest Inventory
C. Achievement test