CHAPTER-2

REVIEW
OF
RELATED LITERATURE

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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