CHAPTER-II

REVIEW OF RELATED LITERATURE

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2.1. INTRODUCTION

Research takes the advantage of the knowledge which has accumulated in the past as a result of constant human endeavour. It can never be undertaken in isolation of the work that has already been done on problems which are directly or indirectly related to a study proposed by a researcher. A careful review of the research journals, books, dissertations, thesis and other sources of information on the problem to be investigated is one of the important steps in the planning of any research study.

The review of related literature helps the researcher to delimit and define his problem. It brings the researcher up-to-date on the work which others have done and thus to state objectives clearly and concisely. It helps the researcher avoid 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. It helps to know about the tools and instruments to be used and also provides insight into statistical methods through which validity of results is to be established. The final and important specific reason for reviewing related literature is to know about the recommendations of previous researchers for further research which they have listed in their studies.

2.2. Theoretical Foundations and Global Perspectives

Jean Piaget (1952) emphasized that children acquire cognitive abilities through direct interaction with their environment. According to his theory, manipulating concrete objects plays a key role in helping children internalize abstract mathematical concepts. Hands-on materials such as blocks, counters, and geometric toys are especially effective in facilitating mathematical thinking and logical reasoning.

Jerome Bruner (1960) proposed the theory of representation, where learners construct knowledge through enactive (action-based), iconic (image-based), and symbolic (language-based) modes. His idea of discovery learning and scaffolding supports toy-based pedagogy, as children actively explore and construct understanding through structured play.

Maria Montessori (1964) introduced a hands-on, child-centered educational approach that emphasized learning through carefully designed didactic materials. Montessori materials, which qualify as structured educational toys, aim to develop sensory

awareness and early mathematical understanding through tactile and manipulative experiences.

Lev Vygotsky (1978) introduced the concept of the Zone of Proximal Development (ZPD), which highlights the importance of social interaction in learning. According to Vygotsky, learning occurs most effectively when children are supported by peers or adults within their ZPD. Toy-based activities often provide opportunities for collaborative learning, enabling students to extend their thinking through guided discovery.

Kersh, Casey, and Young (2008) found that children who engaged with construction toys such as LEGO demonstrated improved spatial reasoning and problem-solving abilities. These skills are critical in mathematical learning, particularly in geometry, measurement, and logical thinking.

Clements and Sarama (2009) established that early childhood mathematics programs incorporating structured toys and manipulatives significantly enhanced foundational mathematical skills. Their research supports the alignment of play-based activities with developmental learning trajectories in mathematics.

2.3. Empirical Studies in the Indian Context

Saravanan and Devi (2018) conducted a study on middle school students and found that the use of geometric toys significantly improved spatial reasoning and comprehension of shapes, angles, and symmetry. The study concluded that toy-based learning increased engagement and mathematical accuracy.

Kumari (2019) investigated the use of manipulatives among low-achieving students in arithmetic and observed that tools such as number lines, abacuses, and counters helped improve conceptual understanding and confidence. The study emphasized that toy-based methods are particularly beneficial for learners struggling with abstract content.

Pathania and Sinha (2020) undertook experimental research with Class 6 students and reported that those taught through toy-based methods showed superior performance in measurement and symmetry. The use of interactive tools and hands-on activities resulted in higher retention and conceptual clarity.

NITI Aayog (2020) highlighted the importance of promoting indigenous toys as part of educational reform. It encouraged the use of culturally relevant and locally produced toys in classrooms, aligning with the larger vision of integrating experiential and joyful learning.

NEP (2020) marked a significant policy shift by advocating activity-based, experiential learning across all levels of education. The policy recommends incorporating both traditional and modern educational toys to support learning across subject areas, especially in foundational numeracy.

NCERT (2021) released guidelines to encourage toy-based learning in formal education. The guidelines advocated for the use of low-cost, recyclable, and indigenous toys to make classroom learning more engaging and relatable, particularly in mathematics.

Gupta and Arora (2021) found that students in Delhi government schools taught using low-cost educational toys showed better understanding of number systems and geometry. The study emphasized that toy-based methods reduced anxiety and enhanced classroom participation.

India Toy Fair (2021) served as a platform to promote educational toys and highlighted innovations in play-based learning. The initiative stressed the value of integrating indigenous toys into formal curriculum to foster deeper learning and national identity.

CBSE (2022) implemented a pilot program integrating toys and games into the middle school mathematics curriculum. The initiative resulted in increased engagement, improved scores in topics like fractions and geometry, and positive feedback from both students and teachers.

2.4. RESEARCH GAPS IDENTIFIED

- Despite promising results, there are notable gaps in research:
- Few quantitative studies using standardized tests assess the direct impact of toy-based pedagogy on math achievement.
- Limited focus on middle school students, especially Class 6 learners.
- Lack of comparative studies between toy-based and traditional teaching methods in mathematics.
- Addressing these gaps can provide stronger evidence and guidelines for implementing toy-based pedagogy effectively in classrooms.

2.5. CONCLUSION

The reviewed literature strongly supports toy-based pedagogy as an effective approach to enhancing mathematics learning through active, concrete, and social experiences. Constructivist theories and Indian educational policies endorse such methods. Empirical studies from India and abroad validate the benefits of manipulatives and educational toys in improving student understanding and achievement. However, more focused research on Class 6 students and rigorous quantitative evaluation is needed, which this dissertation aims to provide.