CHAPTER 5: SUMMARY, FINDINGS, AND SUGGESTIONS

5.1 INTRODUCTION

This chapter provides a comprehensive summary of the dissertation, consolidating the key findings from the content analysis of the NCERT Sixth Grade Mathematics Textbook in alignment with the Cross-cutting Themes (CCTs) of the National Curriculum Framework for School Education (NCFSE) 2023. It restates the problem, objectives, and methodology, synthesizes the major findings, discusses their implications, and offers suggestions for curriculum development, educational practice, and future research. The chapter concludes with reflections on the study's contributions to NCERT's mission of fostering holistic and inclusive learning as per the National Education Policy (NEP) 2020 and NCFSE 2023.

5.2 STATEMENT OF THE PROBLEM

The present study is entitled as “A Critical Analysis of New NCERT Sixth Grade Mathematics Textbook in light of Cross-cutting Themes of NCFSE 2023.”

5.3 OBJECTIVES OF THE STUDY

The primary aim of this study is to conduct a critical analysis of the new NCERT sixth grade mathematics textbook in light of the Cross-cutting Themes (CCTs) outlined in the National Curriculum Framework for School Education (NCFSE) 2023. The study intends to evaluate the depth, and effectiveness of integrating these themes within the textbook’s content and pedagogical approach. The specific objectives of the study are as follows:

1. To identify the presence and frequency of CCTs in the textbook’s content and activities.

2. To evaluate how well the textbook aligns with NCFSE 2023 guidelines for CCT integration.
3. To assess the pedagogical strategies used to embed CCTs in mathematical concepts.
4. To examine the inclusivity and relevance of CCT-related examples and exercises.

5.4 METHODOLOGY

This study employed a mixed-methods research approach to critically evaluate the integration of Cross-Cutting Themes (CCTs)—Rootedness in India, Environmental Awareness, Inclusion, Values and Dispositions, Educational Technology, and Guidance and Counselling—in the NCERT Sixth Grade Mathematics Textbook, "Ganita Prakash," as aligned with the National Curriculum Framework for School Education (NCFSE) 2023. By integrating qualitative and quantitative methods, the study provided a comprehensive analysis of CCT representation and stakeholder perceptions in the Bhopal context.

The qualitative component involved thematic content and visual analysis of the textbook's chapters, examples, exercises, and pedagogical strategies. This approach explored the context, depth, and effectiveness of CCT integration, addressing research questions on alignment with NCFSE 2023 and the pedagogical strategies employed to foster inclusive and culturally relevant learning.

The quantitative component analyzed 45 valid survey responses from teachers and student-teachers, collected via a structured questionnaire with 27 Likert-scale items (1 = Strongly Disagree, 5 = Strongly Agree). Descriptive statistics, including percentages and means, quantified stakeholder perceptions of CCT integration. Additionally, a structured checklist and coding framework

measured the frequency and distribution of CCT-related content across the textbook, complementing qualitative insights with numerical data.

Adopting a descriptive research design, the study systematically described the presence, depth, and implementation of CCTs without inferring causality. This design was suitable for evaluating educational materials and stakeholder feedback within the Bhopal context, ensuring alignment with the study's objectives of assessing NCFSE 2023 compliance and identifying pedagogical strengths and gaps.

5.5 FINDINGS OF THE STUDY

The evaluation of "Ganita Prakash" revealed varied levels of integration for the six CCTs, with strengths in Rootedness in India, Inclusion in Schools, and Values and Dispositions, but notable gaps in Environmental Awareness, Educational Technology, and Guidance and Counselling. Data from 45 teachers and student-teachers, collected via a 27-item Likert-scale questionnaire (1 = Strongly Disagree, 5 = Strongly Agree), checklist counts, and qualitative analyses, provided a comprehensive assessment.

- **Rootedness in India**: The textbook excels with 139 instances across chapters, particularly in Chapters 3, 4, 7, and 9, featuring Indian mathematicians (e.g., D.R. Kaprekar, Brahmagupta), cultural contexts (e.g., rangoli, Diwali), and historical concepts (e.g., Virahānka numbers). Mean questionnaire ratings of 4.02–4.29 reflect strong stakeholder approval, confirming alignment with NCFSE 2023's cultural focus.
- **Values and Dispositions**: Equally strong with 139 instances, the textbook promotes collaboration and perseverance through activities like Math Talk (Chapter 1), group budgeting (Chapter 9), and fair division tasks (Chapter 7). High ratings (4.11–4.20) and interview feedback highlight its success in fostering 21st-century skills.

- **Inclusion in Schools**: The textbook integrates 56 instances, with strong representation in Chapters 4, 7, and 9 (8 instances each), using diverse names (e.g., Navya, Shabnam, Arjun) and accessible tasks. Gender neutrality is evident, with equal representation of boys and girls (e.g., Riya and Amit in Chapter 4) and no stereotypes, enhancing equity. Ratings of 3.76–4.09 indicate accessibility, though support for gifted and slow learners is limited.
- **Environmental Awareness**: Limited to 31 instances, primarily in Chapter 9 (rainwater harvesting, river lengths) and Chapter 4 (tree data), with a low rating of 3.84, indicating a gap in sustainability education despite strong real-life applicability (4.36).
- **Educational Technology**: Only 36 instances, focused on computational thinking (e.g., Sieve of Eratosthenes in Chapter 5), with a low rating of 3.82, reflecting minimal digital tool integration.
- **Guidance and Counselling**: Limited to 27 instances, mainly teacher-guided tasks in Chapters 4 and 9, with moderate ratings, highlighting a lack of socio-emotional learning elements.

Visual and content analyses (rated 0–3) showed strong visuals and content depth for Rootedness in India, Inclusion, and Values and Dispositions in Chapters 4, 7, and 9, but weaker integration elsewhere. Inclusion visuals and content in these chapters feature gender-neutral depictions (e.g., boys and girls making charts in Chapter 4), though the absence of female mathematicians (e.g., Sujatha Ramdorai) limits inspirational representation. The textbook's pedagogical strategies, including collaborative tasks (e.g., Math Talk) and hands-on activities (e.g., thread art), are effective but require digital and reflective enhancements.

5.6 IMPLICATIONS OF THE FINDINGS AND SUGGESTIONS

The study's findings have significant implications for mathematics education in India. The strong integration of Rootedness in India and Values and Dispositions positions "Ganita Prakash" as a culturally relevant and skill-focused resource, aligning with NCFSE 2023's vision of a rooted yet modern education system. The textbook's gender-neutral content and visuals, with 56 instances of diverse names and equal roles, promote equity, but the absence of female role models limits its potential to inspire female students, particularly in a STEM context. The limited environmental and technological integration suggests a need for curriculum revision to meet global educational standards emphasizing sustainability and digital literacy (UNESCO, 2020).

The critical need for teacher training is evident from interview feedback highlighting implementation challenges. Teachers' doubts about the lack of repetitive questions and reliance on guides indicate a gap in understanding NCFSE 2023's exploratory pedagogy. Without training, teachers may struggle to adapt collaborative tasks for large classrooms, assess open-ended questions, or integrate CCTs effectively, undermining the textbook's potential. Training programs addressing these issues can empower teachers to implement "Ganita Prakash" effectively, reducing guide dependency and enhancing student engagement. Enhanced resource allocation for digital tools and teacher guides with assessment strategies can further bridge these gaps, ensuring a holistic, inclusive, and future-ready mathematics curriculum

5.6.1 SUGGESTIONS

Based on the findings, the following recommendations are proposed to enhance "Ganita Prakash"'s alignment with NCFSE 2023 and address implementation challenges:

➢ **For curriculum developers**

- **Enhance Environmental Awareness**: Integrate conservation-focused tasks across chapters, such as carbon footprint calculations in Chapter 4 or waste management in Chapter 7, to align with sustainability goals.
- **Incorporate Digital Tools**: Add activities using graphing apps (Chapter 4) or geometry software (Chapter 8), possibly via QR codes linking to online resources, to strengthen Educational Technology.
- **Strengthen Guidance and Counselling**: Include reflective prompts, like journal entries on problem-solving in Chapter 7, to foster socio-emotional learning.
- **Ensure Consistent Cultural Integration**: Extend cultural references (e.g., rangoli in Chapter 8's geometric constructions) to all chapters for uniform Rootedness in India.
- **Enhance Inclusion**: Incorporate female mathematicians (e.g., Sujatha Ramdorai in Chapter 4, Shakuntala Devi in Chapter 3) in content and visuals to inspire female students. Add tiered tasks for gifted and slow learners to enhance accessibility.
- **Support Assessment Design**: Include sample test questions and assessment guidelines in the teacher's manual to address the lack of repetitive exercises, helping teachers create test papers aligned with the textbook's exploratory approach.

➢ **For Teachers**

- **Leverage Collaborative Activities**: Use Math Talk and group budgeting to foster inclusivity and teamwork, ensuring engagement for diverse learners.
- **Supplement with Digital Tools**: Integrate spreadsheet apps for Chapter 9's budgeting or online simulations for Chapter 5's number tasks to address the technology gap.

- **Extend Environmental Projects**: Implement local projects, like measuring school water usage, to enhance sustainability education.
- **Use Gender-Neutral Examples**: Leverage diverse, gender-neutral examples (e.g., local market data projects with balanced roles) to reinforce inclusivity.
- Develop Assessment Skills**:** Participate in training to design test papers using open-ended and exploratory tasks, reducing reliance on guides with answer keys. Practice creating rubrics for tasks like “Figure it Out” to assess student understanding effectively.

➢ **For Policymakers**

- **Provide Comprehensive Teacher Training**: Offer professional development programs focused on NCFSE 2023’s CCTs, emphasizing strategies for implementing exploratory pedagogy, designing assessments without repetitive questions, and integrating gender-neutral and environmental tasks. Training should address classroom management for collaborative activities in large classes and reduce dependence on guides.
- **Establish Monitoring Mechanisms**: Create frameworks to assess CCT integration and teacher implementation in future textbook editions, ensuring NCFSE 2023 alignment.
- **Support Resource Development**: Fund digital and environmental resources to supplement "Ganita Prakash," enhancing its modernity and sustainability focus. Develop teacher guides with sample test papers and rubrics to support assessment design**.**

5.7 FUTURE RESEARCH DIRECTIONS

Future research can address the study’s limitations and extend its findings:

- **Broader Sampling**: Include teachers and students from diverse regions (e.g., rural, urban, tribal areas) to enhance generalizability.
- **In-Depth Gender Analysis**: Conduct a dedicated gender analysis using frameworks like NCERT's gender perspective tool to explore power dynamics, occupational representation, and stereotype prevalence in "Ganita Prakash."
- **Environmental Focus**: Investigate strategies for integrating sustainability-focused tasks across all chapters, assessing their impact on student engagement.
- **Technological Integration**: Evaluate the feasibility of digital tool incorporation (e.g., apps, simulations) in mathematics textbooks, measuring their effect on learning outcomes.
- **Teacher Implementation**: Examine teachers' classroom practices with "Ganita Prakash," focusing on assessment design, adaptation of collaborative tasks, and guide usage, to inform training programs.
- **Longitudinal Studies**: Assess the long-term impact of "Ganita Prakash"'s CCT integration on student performance and attitudes toward mathematics.

5.8 CONCLUSION

The evaluation of "Ganita Prakash" demonstrates its strengths in embedding Rootedness in India, Inclusion, and Values and Dispositions, with 139, 56, and 139 instances, respectively, aligning with NCFSE 2023's cultural and skill-development goals. The textbook's gender-neutral content and visuals, featuring diverse names (e.g., Navya, Shabnam) and equal roles, enhance inclusivity, though the absence of female mathematicians as role models limits its inspirational potential. Gaps in Environmental Awareness (31 instances), Educational Technology (36 instances), and Guidance and Counselling (27 instances) highlight areas for improvement in sustainability, digital literacy, and socio-emotional learning. Teachers' concerns about the

lack of repetitive questions, difficulties in test paper creation, and reliance on guides underscore the urgent need for comprehensive training to implement the textbook's exploratory pedagogy. Addressing implementation challenges, such as adapting tasks for large classrooms and designing assessments, through targeted training will enhance classroom effectiveness. Recommendations include integrating conservation tasks, digital tools, reflective prompts, and female role models for curriculum developers; leveraging collaborative and local projects while developing assessment skills for teachers; and providing training and monitoring for policymakers. By addressing these gaps, supporting teachers with robust training, and building on the textbook's inclusive, gender-neutral foundation, "Ganita Prakash" can fully align with NCFSE 2023, delivering a holistic, culturally relevant, and equitable mathematics education.