

Focus on Mathematical Thinking Skills in India's National Education Policy 2020: A Critical Policy Analysis

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ABSTRACT:

The growing emphasis on competency-based education has renewed interest in developing mathematical thinking and Higher-Order Thinking Skills (HOTS) as essential outcomes of school mathematics. Although the National Education Policy (NEP) 2020 advocates conceptual understanding, critical thinking, inquiry-based learning, experiential learning, and competency-based assessment, its contribution to mathematical thinking has not been systematically examined. This study presents a critical conceptual policy analysis of NEP 2020 to investigate the extent to which the policy supports mathematical thinking, promotes HOTS, and prepares teachers to foster these competencies in mathematics classrooms. Using qualitative document analysis, the policy was analysed through the Mathematical Thinking Policy Analysis Framework (MTPAF), comprising four analytical dimensions: mathematical thinking skills, HOTS, assessment, and teacher preparation. The analysis reveals that NEP 2020 provides a strong pedagogical foundation for developing mathematical thinking through its emphasis on conceptual understanding, inquiry-based learning, problem solving, competency-based assessment, and teacher development. However, these provisions remain dispersed across the policy and are not articulated within a coherent mathematics-specific framework. The study proposes that HOTS function as the principal cognitive pathway through which mathematical thinking develops, while recognising that mathematical thinking extends beyond generic higher-order cognition through discipline-specific processes such as abstraction, generalisation, proof, modelling, and mathematical communication. The paper proposes policy recommendations to strengthen curriculum, assessment, and teacher preparation by recognising mathematical thinking as an explicit goal of school mathematics.

Keywords: Mathematical thinking, Higher-Order Thinking Skills, HOTS, National Education Policy 2020, mathematics education, policy analysis, competency-based education, teacher preparation.

1. Introduction

1.1 Growing Importance of Mathematical Thinking Skills

Expectations of school mathematics have been radically altered by the requirements of the modern world. There is a growing recognition that mathematics education should not just be about the acquisition of computation skills or procedural fluency, but also about educating students to be able to reason logically, make connections and recognise patterns, solve problems they have never encountered before, build mathematical arguments and use mathematical ideas to model real-life situations. Together, these skills are referred to as mathematical thinking, and have emerged as a core part of current mathematics education reforms across the globe (Kilpatrick et al., 2001; National Council of Teachers of Mathematics [NCTM], 2014; Organisation for Economic Co-operation and Development [OECD], 2023). The capacity to develop, apply and interpret mathematical understandings in a variety of contexts is increasingly assessed by international large-scale assessments such as the Programme for International Student Assessment (PISA), which is a shift towards mathematical reasoning, modelling and problem solving (OECD, 2023). Likewise, curriculum frameworks across many countries now emphasise conceptual understanding, enquiry, reasoning and mathematical communication as essential outcomes of school mathematics (NCTM, 2014). These international reforms further emphasise that effective mathematics instruction should engage learners in reasoning, problem solving, productive mathematical discourse and the development of conceptual understanding through meaningful classroom practices rather than procedural instruction alone (NCTM, 2014). Similarly, the OECD's mathematics framework highlights mathematical reasoning, problem solving and modelling as essential competencies required for successful participation in contemporary society (OECD, 2023).

A significant body of mathematics education research suggests that the development of mathematical thinking depends upon learners

engaging in higher levels of cognition rather than routine memorisation or algorithmic practice. Skills such as analysing relationships, evaluating mathematical arguments, making conjectures, constructing proofs, generalising patterns and creating multiple solution strategies require learners to operate at the upper levels of Bloom's revised taxonomy, namely analysing, evaluating and creating (Anderson & Krathwohl, 2001). Higher-Order Thinking Skills (HOTS) can then be considered as one significant cognitive pathway in the development of mathematical thinking.

Meanwhile the relationship is two way and not hierarchical. Higher order thinking skills are further developed through the ability to reason, reflect and problem solve as students engage in authentic mathematical thinking, which involves ongoing reasoning, reflection and problem solving (Schoenfeld, 1992; Mason et al. 2010). Thus, although conceptually different, HOTS and thinking mathematically are pedagogically inseparable in good mathematics teaching. There are significant similarities between the two constructs. In the process of mathematical reasoning, problem solving and proof, learners must analyse, evaluate competing arguments and develop new representations or solution strategies, all of which represent the upper levels of Bloom's revised taxonomy - analysing, evaluating and creating (Anderson & Krathwohl, 2001). By contrast, it is quite natural to develop these "higher order" cognitive processes in an authentic way of mathematical thinking, for instance, through the process of conjecturing, reasoning, modelling and justification (Schoenfeld, 1992; Kilpatrick et al., 2001; Mason et al., 2010). The National Council of Teachers of Mathematics (NCTM) also notes that higher-order thinking and mathematical proficiency are advanced when using rich mathematical tasks, reasoning, and productive struggle and classroom discourse as instructional practices (NCTM, 2014). HOTS and mathematical thinking are, therefore, best seen as complementary and mutually reinforcing conceptions.

Table 1 Relationship between Mathematical Thinking Skills and HOTS

Mathematical Thinking Skills	HOTS Component	Relationship
Logical reasoning	Analyse	Identifying mathematical relationships and drawing logical conclusions
Problem solving	Analyse, Evaluate, Create	Selecting, comparing, and designing solution strategies
Pattern recognition	Analyse	Identifying regularities and mathematical structures
Abstraction	Analyse, Create	Formulating general mathematical ideas from specific cases
Generalisation	Create	Extending patterns to broader mathematical principles
Mathematical proof	Evaluate	Justifying conclusions using logical arguments
Mathematical modelling	Create	Representing real-world situations mathematically
Mathematical communication	Evaluate	Explaining and defending mathematical reasoning
Reflection and meta-cognition	Evaluate	Monitoring and improving one's mathematical thinking

The table, however, illustrates that while HOTS constitute an important pathway for developing mathematical thinking, mathematical thinking encompasses additional discipline-specific competencies that are not explicitly represented within Bloom's cognitive taxonomy. Therefore, strengthening HOTS in school mathematics is likely to enhance mathematical thinking, provided instructional practices also cultivate mathematical reasoning, proof, modelling, abstraction, and mathematical communication.

It becomes evident that Mathematical thinking and Higher-Order Thinking Skills (HOTS), although closely related, are conceptually distinct constructs. HOTS represent a broad cognitive framework applicable across disciplines, whereas mathematical thinking comprises discipline-specific cognitive processes unique to mathematics. Mathematical thinking involves abstraction, generalisation, symbolic

representation, mathematical proof, modelling, conjecturing, justification and quantitative reasoning, all of which are fundamental to doing mathematics and extend beyond the generic cognitive categories described in Bloom's revised taxonomy (Schoenfeld, 1992; Kilpatrick et al., 2001; Mason et al., 2010).

Hence, while HOTS is necessary, it is not sufficient to develop the entire range of mathematical thinking skills amongst learners.

1.2 Education Policy

Recognising the growing importance of higher-order competencies, many countries have introduced policy reforms that seek to transform mathematics education from procedural instruction to competency-based learning. In India, the National Education Policy (NEP) 2020 is the country's most significant educational reform in over three decades and serves as the overarching policy guiding curriculum, pedagogy, assessment and teacher education across

school education (Ministry of Education, 2020). Given its central role in shaping educational practice, NEP 2020 has the potential to influence how mathematics is taught, learned and assessed in Indian classrooms. Consequently, it is important to critically examine the extent to which the policy addresses two closely related educational priorities: the development of mathematical thinking and the promotion of Higher-Order Thinking Skills (HOTS). Such an examination is essential for understanding whether the policy provides sufficient direction for cultivating the kinds of mathematical competencies increasingly emphasised in contemporary mathematics education.

Equally important is the role of teachers in translating policy aspirations into classroom practice. Educational policies achieve their intended impact only when teachers are able to interpret, implement and sustain the pedagogical changes they envision (Pullan, 2007). Mathematics teachers occupy a particularly significant position because the development of mathematical thinking depends not only on curriculum content but also on the nature of classroom discourse, the quality of mathematical tasks, opportunities for reasoning and problem solving, and the assessment practices employed by teachers. Therefore, alongside examining the policy's orientation towards mathematical thinking and HOTS, it is equally important to investigate how NEP 2020 proposes to prepare and support teachers for implementing these competencies in everyday mathematics classrooms. Such an analysis can provide valuable insights into the coherence between policy intentions, teacher preparation and classroom implementation.

2. Research Gap

The impact of National Education Policy 2020 on competency based education, assessment reform, teacher education and curriculum transformation have been explored in the body of literature. Various researchers have credited the policy with fostering the development of critical thinking, creativity, experiential learning,

inquiry-based learning and problem solving as 21st century skills. Likewise, educational researchers have studied the meaning and importance of mathematical thinking in enhancing mathematics learning outcomes, as well as Higher-Order Thinking Skills.

However, there are four gaps in the current literature.

1. While there has been significant amount of scholarly discussion on curriculum reform and assessment practices with the NEP 2020, there is not much in the literature that focuses on the policy with regard to mathematical thinking explicitly.

2. Although HOTS is often referred to as an educational goal, the connection between HOTS and mathematical thinking in the policy context has not been analysed systematically. This is a significant gap in the literature, especially when considering how these constructs are conceptualised, supported and operationalised in the national policy and how this can inform curriculum development, teacher education, classroom pedagogy, and future national policy revisions. In view of these gaps, the present study critically analyses NEP 2020 to examine how the policy addresses mathematical thinking and Higher-Order Thinking Skills and prepares teachers to cultivate these competencies in school mathematics.

3. There are relatively few studies on NEP 2020 with a focus especially on school mathematics. Educational reforms are often talked about in broad terms without considering their implications for mathematics pedagogy or mathematics-specific competencies or mathematical reasoning at school level.

4. While the NEP 2020 repeatedly calls for competency based education, conceptual understanding, inquiry and competency based assessment, it is necessary to examine and analyse whether all these policy prescriptions together give sufficient guidance for systematically building mathematical thinking in classroom practice. The current literature mainly discusses the goals of the policy, rather than reviewing its existing strengths as well as its existing

weaknesses conceptually, its implementation difficulties, and/or its mathematics-specific weaknesses.

Accordingly, there remains a need for a critical policy analysis that systematically examines the extent to which NEP 2020 supports the development of mathematical thinking skills and Higher-Order Thinking Skills in school mathematics while identifying policy gaps and proposing directions for strengthening future curriculum and implementation frameworks.

3. Research Questions

The present study is guided by the following research questions:

RQ1. To what extent do the provisions of the National Education Policy 2020 support the development of mathematical thinking skills in school mathematics?

RQ2. How do the provisions of NEP 2020 promote Higher-Order Thinking Skills (HOTS) within the context of mathematics education?

RQ3. What conceptual and implementation gaps exist in NEP 2020 with respect to fostering mathematical thinking and HOTS in mathematics education?

RQ4. What policy recommendations can strengthen the integration of mathematical thinking skills and Higher-Order Thinking Skills within future curriculum, pedagogy, teacher preparation, and assessment reforms?

4. Methodology

4.1 Research Design

This study adopted a **qualitative conceptual policy analysis** to examine the extent to which the National Education Policy (NEP) 2020 promotes mathematical thinking skills and Higher-Order Thinking Skills (HOTS) in school mathematics. Policy analysis is particularly appropriate for examining the philosophical assumptions, educational priorities, and implementation directions embedded within national education policies. Unlike empirical studies that investigate classroom practices or

learner outcomes, conceptual policy analysis critically evaluates policy documents to identify their underlying principles, strengths, limitations, and implications for educational practice.

4.2 Data Source

The primary source of data was the official **National Education Policy 2020** published by the Ministry of Education, Government of India (Ministry of Education, 2020). The policy document was selected because it represents the current national framework guiding curriculum development, pedagogy, assessment, teacher education, and educational reforms across school education in India.

4.3 Analytical Framework

The analysis focused primarily on policy provisions relating to:

- competency-based education;
- conceptual understanding;
- critical thinking;
- creativity;
- inquiry-based learning;
- experiential learning;
- discovery-based learning;
- problem solving;
- competency-based assessment;
- teacher development; and
- technology-enabled teaching and learning.

A four dimension analysis framework was derived by synthesising literature on mathematical thinking (Mason et al., 2010; Schoenfeld, 1992), Higher-Order Thinking Skills (Anderson & Krathwohl, 2001; Brookhart, 2010), and competency-based education (OECD, 2019). Together, they provide an analytical lens for evaluating the extent to which NEP 2020 creates a coherent policy environment for developing mathematical thinking in school mathematics.

Table 2. Mathematical Thinking Policy Analysis Framework (MTPAF):**Data Analysis Framework**

Analytical Dimension	Key Policy Indicators	Constructs Examined	Evaluation Criteria
Mathematical Thinking Skills	Conceptual understanding, inquiry-based learning, experiential learning, logical reasoning, problem solving, modelling, abstraction, generalisation, mathematical proof, mathematical communication, representation, quantitative reasoning, creativity	Abstraction, conceptualisation, reasoning, generalisation, modelling, proof, representation, problem solving, mathematical communication, quantitative reasoning	Does the policy explicitly promote the development of mathematical thinking through mathematics-specific processes?
Higher Order Thinking Skills (HOTS)	Critical thinking, analytical thinking, creativity, decision making, innovation, application of knowledge, reflective thinking	Analysis, evaluation, synthesis, reflective thinking, creative thinking	Does the policy promote higher order cognitive processes that support the development of mathematical thinking?
Assessment	Competency-based assessment, formative assessment, authentic assessment, application oriented assessment, reasoning based assessment, performance tasks	Assessment of conceptual understanding, mathematical reasoning, problem solving, application of knowledge, mathematical proficiency	Do the assessment provisions evaluate mathematical thinking and higher order competencies rather than rote memorisation?
Preparing Teachers for Implementation	Initial teacher education, professional development, pedagogical approaches including inquiry-based pedagogy and competency-based pedagogy, classroom assessment, continuous professional learning	Teacher competencies for facilitating mathematical reasoning, inquiry, problem solving, assessment literacy and classroom discourse	Does the policy adequately prepare teachers to foster mathematical thinking and HOTS through effective mathematics pedagogy?

4.4 Data Analysis Process

The policy document was analysed using **qualitative document analysis**, a systematic method for reviewing and interpreting textual documents to derive meaning, identify themes, and generate conceptual understanding (Bowen, 2009). Relevant policy statements were

identified through repeated reading of the document and coded according to four broad analytical dimensions.

Particular attention was given to provisions contained in the **Foundational Principles** of the policy, **Chapter 4 (Curriculum and Pedagogy in Schools)**, relevant sections on

assessment reforms, and Chapter 23 (Technology Use and Integration) because these sections have direct implications for mathematics teaching and learning.

The analysis involved four stages:

Stage1. Document Familiarisation: Multiple readings of NEP 2020 to identify provisions relevant to mathematics education, cognition, pedagogy, assessment, and teacher development.

Stage2. Open Coding: Extraction of policy statements related to conceptual understanding, inquiry, problem solving, critical thinking, competency-based education, assessment, and technology integration.

Stage3. Thematic Categorisation: Grouping coded statements under the four analytical dimensions and mapping them to recognised components of mathematical thinking and Higher-Order Thinking Skills.

Stage4. Critical Interpretation: Evaluation of the strengths, implicit assumptions, omissions, and implementation challenges within the policy, followed by the development of a conceptual framework illustrating the relationship between competency-based education, HOTS, and mathematical thinking.

5. Findings and Critical Policy Analysis

Although the policy does not mention "mathematical thinking" as a key competency of education, the analysis of the policy shows that it offers a solid philosophical and pedagogical underpinning for developing mathematical thinking. Rather, the policy continually emphasizes conceptual understanding, inquiry-based learning, experiential learning, critical thinking, creativity, competency-based assessment, and problem solving. These provisions in total create an implicit way to foster mathematical thinking in school.

The results are presented in the order of the Mathematical Thinking Policy Analysis Framework (MTPAF) consisting of four broad dimensions including, three sub-dimensions under the head of mathematical thinking.

5.1. Mathematical Thinking

5.1.1. Conceptual Understanding: The Foundation of Mathematical Thinking

A key change brought in by NEP 2020 is the transition from memorisation to understanding concepts. Paragraphs 4.4 and 4.5 recommend reducing curriculum content to core concepts and promoting experiential, inquiry-based, discussion-based, discovery-based and analysis-based learning. Meaningful learning happens when learner comprehends rather than regurgitates.

This is a significant policy change for maths teaching. Conceptual understanding is a prerequisite of abstraction, generalisation mathematical representation and mathematical reasoning essential aspects of mathematical thinking. Familiarity with the rationale behind mathematical procedures helps students to transfer knowledge to new context and develop logical arguments as well as assess the merits of other approaches to solving problems.

However, it must be stated that though the policy strongly promotes the proponents of conceptual understanding, it does not explicitly articulate how mathematical concepts will be increasingly developed into higher levels of mathematical reasoning. As a result, it becomes up to the individual curriculum developer and teacher to apply them in their own way, leading to less uniformity within classrooms.

Critical Observation

It is good that NEP 2020 has laid down the concept of conceptual understanding as the starting point of the learning process, but it fails to frame a developmental framework for mathematics that can be applied as mathematics-specific.

5.1.2. Mathematical Reasoning: Inquiry and Experiential Learning

The NEP 2020 has always favored the approaches of inquiry-based, discovery-based, and experiential learning. The focus here is to let students discover, make predictions, explore, and develop understanding based on their own

experiences and not on what is presented to them.

Critical Observation

The policy recognizes that mathematical reasoning develops through active engagement with meaningful problems rather than passive reception of knowledge. Nevertheless, realizing this vision requires systemic support, including curriculum redesign, assessment reforms, teacher capacity building, and access to appropriate learning resources.

5.1.3. Problem Solving

Along with this, within mathematics education, natural competencies in problem solving, mathematical modelling, logical reasoning and strategic thinking are developed when engaging in inquiry. In the same way, experiential learning helps students identify mathematics in the real-world situation, deepening their conceptual understanding and transfer of learning.

The policy thus creates a favourable pedagogical conditions for mathematical thinking. However, there is a lack of direction for mathematics. The policy does not provide clarity on the differences between mathematics instruction and instruction in other subjects based on inquiry, nor on how mathematics problem solving skills are expected to develop from grade level to grade level.

Critical Observation

The pedagogical principles that NEP 2020 promotes are well aligned with the promotion of mathematical thinking, but are generally more generic and less mathematics-specific.

5.2 HOTS as the Cognitive Engine of Mathematical Thinking

One of the most important conclusions of this analysis is that the cognitive processes that are promoted by Higher-Order Thinking Skills (HOTS) are seen repeatedly in the NEP 2020. Learners should be analysing, investigating, evaluating, creating, reasoning, communicating, solving problems and

thinking critically throughout (chapter 4), and not just memorising the material.

These competencies are directly related to internationally recognised aspects of mathematical thinking, although rarely explicitly identified in the policy. In mathematical reasoning, learners must: analyse relationships; evaluate mathematical arguments; construct proof; identify patterns and develop new mathematical ideas. The focus of the policy on HOTS therefore supports the development of mathematical thinking.

This connection is the key conceptual argument in the present study. Mathematical thinking can be seen as a higher-order cognition that manifests itself in mathematics. Hence, the educational policies that are successful in developing HOTS in mathematics also develop mathematical thinking.

However, this relationship is not explicitly mentioned in NEP 2020. It is a significant policy gap that the link between HOTS and mathematical thinking is not explained conceptually.

Critical Observation

The policy is very supportive of the use of HOTS in school education. Still, the identification of HOTS as the main cognitive track that leads to mathematical thinking would more concretely establish the conceptual coherence.

5.3. Assessment Reform: A Major Strength of NEP 2020

One of the most robust developments in policy to support mathematical thinking is assessment reform. Paragraphs 4.34 - 4.37 promote competency-based assessment that focuses on knowledge and understanding, as well as application, analysis and critical thinking. It is against mere emphasis on rote learning and recalling of facts.

The reforms closely match international recommendations for mathematics assessment. These recommendations increasingly give more weight to the idea of mathematics as reasoning,

explanation, communication and genuine problem-solving rather than just procedural correctness.

While the policy states that assessment should be based on competency, there is little guidance about how competency in mathematics is assessed. Specialist assessment strategies are needed to assess mathematical reasoning, proof, modelling and abstraction; these are distinct from generic competency assessment.

Critical Observation

There is a recommendation for change in assessment to strengthen mathematical thinking, but due to lack of explicit assessment frameworks, implementation may focus on procedural competence rather than a broader policy focus.

However, with the support of mathematics-specific descriptors, exemplars and scoring rubrics, assessment reform has the promise of transforming mathematics education.

5.4. Teacher Preparation: The Missing Link

The emphasis of NEP 2020 is on teachers whom, it sees as pivotal to transform the education system. Thus NEP 2020 seeks to promote continuous professional development, autonomy and innovative

pedagogies. These provisions recognise that the competency of teachers is essential for the implementation of the policy rather than just a policy statement.

However, there is limited mathematics-specific professional development that relates to inquiry, mathematical reasoning, proof, modelling or competency-based mathematics assessment. This results in teachers being comfortable with conceptual learning but not in developing mathematical thinking in a systematic way.

Moreover, new technologies in education, such as artificial intelligence present a chance to enhance mathematical inquiry, formative assessment and personalised learning. Yet technology should be viewed as a supporting pedagogical resource rather than the principal driver of educational reform. Teacher judgement, mathematical expertise and classroom interaction remain indispensable for developing genuine mathematical thinking.

Critical Observation

Teacher professional development should move beyond general pedagogical reforms towards mathematics-specific programmes. The programmes should explicitly focus on developing mathematical thinking as well as on assessing higher-order mathematical competencies.

**Table 3. Mathematical Thinking Policy Analysis Framework (MTPAF):
Mapped to Exact NEP 2020 Provisions**

Analytical Dimension	Relevant NEP 2020 Provisions	Exact NEP Paragraphs	Contribution to Mathematical Thinking	Critical Policy Observation
1.Mathematical Thinking Skills: 1.1.Conceptual Understanding	Reduction of curriculum content to promote deeper understanding rather than rote memorisation, emphasis on experiential, discussion-based and competency-based learning.	4.4, 4.5, 4.34	Develops abstraction, conceptualisation mathematical connections and deep understanding	Strong policy emphasis on conceptual understanding. However, mathematical thinking is never explicitly defined as an educational outcome

Analytical Dimension	Relevant NEP 2020 Provisions	Exact NEP Paragraphs	Contribution to Mathematical Thinking	Critical Policy Observation
1. Mathematical Thinking Skills: 1.2 Mathematical Reasoning	Inquiry-based learning, discovery-based learning, discussion-based learning, analysis-based learning, critical thinking and logical decision making	4.4, 4.5	Encourages reasoning, justification, mathematical communication and generalisation	Reasoning is promoted indirectly through pedagogy but mathematical proof, deductive reasoning and argumentation receive no explicit attention
1.Mathematical Thinking Skills: 1.3. Problem Solving	Experiential learning, problem-based learning, competency-based education, application of knowledge to real life contexts.	4.4, 4.5, 4.34	Develops modelling, application, strategic thinking and problem-solving competence	Strong emphasis on authentic problem solving. However, no developmental progression for mathematical problem solving is specified
2. Higher Order Thinking Skills (HOTS)	Critical thinking, creativity, analysis, conceptual clarity, flexibility and scientific temper	4.4, 4.5, 4.34, 11.1	Supports reasoning, reflection, creativity and evaluation, thereby, strengthening mathematical thinking	HOTS is one of the strongest recurring themes of NEP 2020. Although mathematics is not specifically discussed, these provisions naturally support mathematical thinking
3. Assessment	Shift towards competency-based assessment, assessment for learning, emphasis on analysis, critical thinking and conceptual clarity, holistic progress report card, Board examination reforms	4.4, 4.5, 4.36, 4.37	Encourages explanation, reasoning, application and mathematical communication	One of the strongest policy sections. However, mathematics-specific competency descriptors and reasoning rubrics are absent
4. Preparing Teachers for Implementation	Continuous professional development (CPD); teacher autonomy; innovative pedagogy; technology-supported professional development; National Educational Technology Forum (NETF)	5.15, 5.16, 23.3, 23.6	Supports teachers in facilitating inquiry, reasoning and competency-based classrooms	Teacher development is recognised as essential but the policy does not support mathematics-specific professional development for cultivating thinking

6. Conclusion

6.1 Overall Policy Synthesis

This study critically examined the National Education Policy (NEP) 2020 through the lens of mathematical thinking and Higher-Order Thinking Skills (HOTS). There are certain strengths as well as lacunae in encouragement of mathematical thinking skills

1. The overall results suggest that NEP 2020 has important pedagogical elements that are needed to build mathematical thinking. Conceptual understanding, inquiry, experiential learning, problem solving, critical thinking and competency-based assessment collectively provide a strong cognitive foundation for mathematics education. However, these provisions remain dispersed throughout the policy and are presented as broad educational principles rather than as components of a coherent mathematics-specific framework.

2. The contribution of NEP 2020 is not just in bringing out the concept of broad educational reforms but to provide a policy context in which mathematical thinking can be fostered. The problem is that the policy implicitly supports mathematical thinking but never explicitly conceptualises it as a distinct educational outcome.

Hence, true potential of the provisions can only be realised if what is implicit is made explicit: development of mathematical thinking needs to be made one of the key objectives of school mathematics in India.

1. Higher Order Thinking Skills function as the primary cognitive pathway through which the broader construct of mathematical thinking develops. The relationship may be represented conceptually as follows:

Competency-based Education ---> Conceptual Understanding ---> Inquiry and Problem Solving ---> Higher-Order Thinking Skills ---> Mathematical Thinking ---> Mathematical Proficiency

This conceptual pathway brings together the provisions of the policies which are

and suggests a framework for curriculum planners, teacher educators, and policymakers to enhance mathematics learning as part of the NEP 2020.

However, this conceptual pathway needs to be made explicit in mathematics education.

6.2. Policy Recommendations to Strengthen Mathematical Thinking

The contribution of NEP 2020 is not only by introducing a general education reform which is based on broad competency-based education, but also by shaping a policy space for cultivating mathematical thinking. However, realising this potential requires making explicit what currently remains implicit: the cultivation of mathematical thinking should be recognised as one of the central goals of school mathematics in India.

1. Explicit recognition of mathematical thinking: Future curriculum frameworks should identify mathematical thinking as a core educational outcome in school mathematics, alongside conceptual understanding and problem-solving competence.

2. Mathematics-specific competency framework: Policy documents should articulate clear developmental progressions for abstraction, generalisation, proof, modelling, symbolic representation, quantitative reasoning, and mathematical communication.

3. Integration of HOTS with mathematical processes: Curriculum and pedagogy should explicitly connect higher-order cognitive processes with discipline-specific mathematical practices such as reasoning, conjecturing, justifying, and proving.

4. Assessment reforms: Competency-based assessment should include mathematics-specific indicators and rubrics for evaluating reasoning, proof, modelling, problem solving, and mathematical communication.

5. Teacher preparation and professional development: Pre-service and in-service teacher education programmes should empower mathematics teachers with strategies for fostering mathematical

thinking and HOTS through inquiry-oriented, discussion-based, and problem-centred classroom practices.

6. Classroom implementation support: Teachers should be provided with exemplar tasks, teaching-learning materials, and assessment tools that illustrate how mathematical thinking can be cultivated across different grade levels.

6.3 Further Research

Further research should examine how the provisions of NEP 2020 are translated into classroom practice and how effectively they promote mathematical thinking and HOTS among learners.

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