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# ALIGNMENT AMONG NATIONAL CURRICULUM STANDARDS, TEXTBOOKS, AND ASSESSMENT METHODS AT ELEMENTARY SCHOOL LEVEL

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## Abstract

*The mathematics curriculum 2020 was framed to unify academic standards and promote critical thinking and cognitive rigor in mathematics. The study measured the alignment between the National Curriculum (NC) 2020, the 8th-grade mathematics textbook, and the Punjab Examination Commission (PEC) assessment using Webb's Alignment Tool Second Version (WAT V2). It employed a descriptive quantitative content analysis, focusing on the curriculum, textbook, and assessment Student Learning Outcomes (SLOs). The data sources were the NC mathematics document, the textbook, the PEC assessment 2023, and six reviewers. WAT V2 analyzed alignment across Depth of Knowledge (DOK) levels. Out of 68 curriculum SLOs, DOK Level-1 (Recall) had 4(5.88%), Level-2 (Skill/Concept) 22(32.35%), Level-3 (Strategic Thinking) 42(61.76%), and Level-4 (Extended Thinking) none (0%). The textbook contained 88 SLOs with Level-1, 15(17.05%), Level-2, 48(54.55%), Level-3, 24(27.27%), and Level-4, 1(1.13%). The PEC assessment showed partial alignment, targeting 33(48.5%) of 68 SLOs, mainly in Numbers & Operations and Algebra, while Measurement, Geometry, and Statistics & Probability were not represented. Most assessment items measured DOK Level-2 and Level-3, with minimal coverage of Levels-1 and 4. These findings reveal gaps among the curriculum, textbook, and assessment, emphasizing mid-level procedural knowledge over higher-order thinking. It is recommended that curriculum writers, textbook developers, and assessment designers should be encouraged to maintain balanced representation across all DOK levels, particularly recall (Level-1) and extended thinking (Level-4), to enhance cognitive growth and fair assessment.*

**Keywords:** *National curriculum, mathematics, alignment, textbook*

## Introduction

Curriculum alignment in mathematics is central to ensuring that the National Curriculum (NC) 2020 is effectively translated into classroom learning. The alignment between the curriculum, textbooks and assessment determines how Student Learning Outcomes (SLOs) and Depth of Knowledge (DOK) levels are represented, ultimately shaping the quality of mathematics education. Gaps in alignment can limit students' opportunities to develop critical thinking and problem-solving skills, making it essential to analyze whether textbooks reflect the intended curriculum standards. This study focuses on measuring the alignment between the NC 2020 Mathematics curriculum and the 8th-grade textbook to identify strengths and areas for improvement.

Curriculum plays a central role in education as it aims at the development of democratic values, citizenship, and character among learners. It also focuses on the satisfaction of learners' needs, acquisition of knowledge, and preparation of students for different roles in life, including future careers. These purposes highlight that curriculum is not limited to content only, but it is a complete plan of learning experiences designed to bring positive changes in learners' behavior,

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skills, and understanding (Ornstein & Hunkins, 2018; Young, 2014). The need to achieve these educational purposes has led to the development of curriculum as a systematic and continuous process (Prideaux, 2003).

Curriculum development involves planning, organization, and decision-making regarding content, learning experiences, and instructional strategies. It is a continuous process that includes situational analysis, formulation of objectives, selection and organization of content, development of instructional materials such as textbooks, and evaluation (Thijs & Van den Akker, 2009). It also considers psychological aspects of learners, subject requirements, and classroom realities to ensure effective implementation. Therefore, curriculum is not only a document but a totality of experiences provided to learners through organized educational activities (Ornstein & Hunkins, 2018).

National Curriculum (NC) provides a clear framework of aims, goals, and objectives that guide teaching, learning, and assessment at different grade levels. It ensures uniformity and consistency in educational practices by defining what students should learn and achieve (Government of Pakistan, 2020). The NC also directs the development of textbooks and assessment systems, so that the intended learning outcomes are properly translated into classroom practice (Anderson, J. 2009; Malik et al., 2023). In this way, curriculum planning and development are closely linked with instructional materials and evaluation processes(Zaman, M. S., Saleem, K., & Ali, S. 2021).

Textbooks are considered the translation of curriculum into practice. They explain and organize content according to curriculum objectives and provide structured learning experiences for students (Johansson, 2003; Rezat, Fan, & Pepin, 2021). Teachers mainly rely on textbooks for classroom teaching; therefore, any difference between curriculum and textbook content can affect the achievement of intended learning outcomes (Riaz, H., & Shah, S. Z. 2019). Proper development and review of textbooks are essential to ensure that they accurately reflect curriculum requirements.

Assessment is another important component that evaluates whether the objectives of the curriculum are achieved. It measures students' knowledge, skills, and understanding through different tasks and examinations (Webb, 2007). Assessment must be aligned with both curriculum and textbooks to ensure that learning is properly measured. If this alignment is weak, it may result in gaps where students are either assessed on content not taught or important learning outcomes are ignored (Ornstein & Hunkins, 2018).

Thus, curriculum, textbooks, and assessment are interrelated components of the education system. Curriculum provides the direction, textbooks support implementation, and assessment evaluates outcomes. Strong alignment among these elements is necessary to ensure effective teaching, meaningful learning, and the overall development of students, particularly in subjects like mathematics where conceptual understanding and problem-solving skills are essential (Crawford & Snider, 2000).

**Statement of the Problem**

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Alignment among curriculum, textbooks, and assessment is essential for maintaining consistency and quality in education. In Grade 8 Mathematics under the National Curriculum 2020 in Punjab, inconsistencies in content coverage, textbook representation, and assessment practices indicate weak alignment across these components. In addition, imbalance in cognitive levels reflects uneven focus on different types of learning. These issues suggest a gap in how curriculum expectations are reflected and maintained across instructional materials and evaluation practices. Such gaps may limit the achievement of intended learning and raise concerns about the fairness and validity of assessment. Therefore, a systematic analysis of alignment is necessary to identify these inconsistencies and ensure coherence among curriculum, textbooks, and assessment.

**Significance of the Study**

This study holds great significance as it provides valuable insights for curriculum developers, textbook writers, assessment designers, and policymakers. By analyzing the alignment between the NC 2020 and the 8th-grade Mathematics textbook, the research highlights existing gaps, overlaps, and differences in prescribed and delivered learning outcomes. Such analysis ensures that the intended curriculum objectives are not diluted or overloaded in textbooks, which directly impacts teaching and learning quality. The findings are particularly useful for curriculum writers to refine standards and ensure coherence between curriculum and instructional materials. Moreover, textbook authors can utilize the results to maintain balance in content coverage and avoid unnecessary additions that may burden students. Assessment authorities can also benefit by aligning test items with actual curriculum standards, ensuring fairness and validity in evaluation. Ultimately, the study contributes to strengthening the education system by promoting consistency among curriculum, textbooks, and assessments, thereby enhancing student learning outcomes and supporting the goals of quality education outlined in the national education policies.

**Research Objective**

The objective of this study is to analyze the alignment between the 8th-grade Mathematics curriculum, textbook and assessment.

## Literature Review

The alignment between curriculum and textbook plays a critical role in ensuring that instructional content reflects national academic standards. In the context of 8th-grade Mathematics under the NC 2020, a clear difference exists between the prescribed curriculum SLOs and those presented in the textbook. While the curriculum defines the intended scope of student learning, the textbook often extends or modifies these expectations, creating a gap that may affect classroom instruction and student outcomes. Identifying and analyzing such differences is necessary to support curriculum developers, textbook writers, and policymakers in maintaining coherence between planned and delivered content (Government of Pakistan, 2020).

When textbooks fail to align fully with the curriculum, students may face inconsistencies in the knowledge and skills they are expected to acquire. This misalignment can result in

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learning disparities, where assessments may measure competencies not adequately covered in textbooks, or textbooks may present material not prioritized in the curriculum. Such challenges underscore the importance of regularly reviewing and evaluating the connection between prescribed learning outcomes and instructional resources Hashmi et al. (2018).

Furthermore, curriculum and textbook alignment ensures that both teachers and learners operate within a coherent educational framework. Teachers rely heavily on textbooks as their primary instructional tool; therefore, any divergence from the curriculum may hinder the effective implementation of national education goals. A well-aligned system enables teachers to deliver lessons that are not only consistent with national standards but also equitable across diverse school settings khansa (2025).

In the case of 8th-grade Mathematics, the issue becomes more significant because mathematics serves as a foundational subject that supports learning in science, technology, and other disciplines. If textbooks deviate from the curriculum SLOs, students risk developing uneven competencies, which can impact their future academic trajectories. Hence, identifying the differences between curriculum and textbook SLOs is crucial for ensuring the effectiveness of the NC reforms (Government of Pakistan, 2020).

During math instruction assessing learners only on recall tasks may fail to capture their full understanding. That is why cognitive complexity has become a central focus in modern curriculum design (Achieve, 2018). The Webb's DOK framework is useful for understanding cognitive complexity of curriculum content. Webb's DOK divides tasks into four levels: recall, skill/concept, strategic thinking, and extended thinking. Each level represents a different kind of thinking that learners need to demonstrate. NC shifted learning beyond memorization and assessment but often remain focused on lower-order tasks. The challenge lies not only in curriculum design but also in assessment. Various alignment models have developed to study curriculum and assessments alignment. The SEC model uses large-scale teacher-reported data to analyze the alignment between taught content and assessment practices, the CBE model evaluates curriculum and assessment alignment through structured analysis of academic rigor and balance (Polikoff, 2012). The WAT is widely used for its structured criteria and focus on cognitive demand. It evaluates alignment based on four areas: categorical concurrence, DOK consistency, range-of-knowledge correspondence, and balance of representation. Each level measure whether assessment items fairly and fully reflected in curriculum standards (Webb, 2007). The WAT is widely used for measuring consistency between curriculum standards and assessments based on content categories and cognitive demand using criteria of categorical concurrence and DOK levels. Each of these alignment models provides tools to assess whether learners are being assessed fairly and according to what the curriculum demands (CCSSO, 2002; Rind & Mughal, 2020; Webb, 2007).This framework supports curriculum designers and assessment developers in evaluating whether tasks reflect the cognitive expectations defined by academic standards Hashmi et al. (2018). The WAT utilizes quantitative coding procedure based on four key criteria;

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- Categorical Concurrence; Ensures content categories in the curriculum align with those in assessments.
- DOK Consistency; Measures if assessments match the cognitive rigor of the curriculum.
- Range-of-Knowledge; Evaluates if assessments cover the full scope of curriculum topics.
- Balance of Representation: Ensures fair distribution of learning outcomes in assessments, preventing overemphasis on single topics.

The DOK framework classifies cognitive complexity into four levels;

- DOK level-1 (Recall); involves basic recall or routine procedures, such as solving a simple equation through simple procedures. For example, defining prime numbers, solving 5x8).
- DOK level-2 (Skill/Concept);focuses on applying skills or concepts, like interpreting graphs, using formulas in structured ways, interpreting data, explaining concepts. For example interpreting a bar graph, solving 2x+5=15).
- DOK level-3 (Strategic Thinking); requires reasoning, planning, or analyzing tasks with multiple steps or strategies in problem-solving with multiple strategies. For example, explaining why two odd numbers sum to an even number, designing a mathematical model).
- DOK level-4 (Extended Thinking); includes extended problem-solving involving connections across different mathematical domains, extensive investigation, synthesis of ideas, real-world application, integrating knowledge across domains. For example, designing a population growth model, or using multiple approaches to solve a problem (Webb, 2007).

Various local and international level studies were design for measuring alignment between curriculum and assessment adopting Webb's alignment model. Gulzar and Mahmood (2019) structured a study on the secondary school mathematics curriculum and BISE Lahore assessments alignment ay 9th-grade in Punjab. Results of the study revealed that the assessment only reflect the categorical concurrence criterion, while it failed to meet acceptable levels for DOK consistency, range-of-knowledge correspondence, and balance of representation. Furthermore, 97% of the assessment items were at DOK Level-1, 41% of level-2, 4%, level-3 and zero for level-4 reflecting a heavy emphasis on recall-level tasks. Notably, no items addressed DOK level-4, indicating that assessments lacked extended thinking or complex reasoning tasks expected from higher cognitive domains.

Khurshid (2023) designed a study on the alignment between NC 2022 science standards and the PEC 2023 assessments. The results of the study declared that categorical concurrence and DOK level consistency were achieved to some extent, balance of representation and range-of-knowledge remained weak reported partial alignment. Furthermore, 84% of the test items were concentrated at DOK Level-1 and Level-2, and no item addressed DOK Level-4, which limits the evaluation of higher-order thinking skills. He concluded that the effectiveness of

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curriculum reforms depends on the precision of assessment frameworks in representing the defined SLOs.

Iqbal, Abbas, and Abbas (2024) framed a qualitative study to analyze teachers' perceptions regarding the implementation of the NC) for mathematics 5th-grade. Researchers interviewed 21 teachers; 15 from public and 6 from private schools using face- to-face using unstructured interviews. The collected data were analyzed through thematic analysis. The study revealed curriculum related challenges, including unrealistic grade-level expectations, lack of coherence between content, SLOs and textbook, and poor alignment curriculum and assessments.

Rind and Mughal (2020) designed a study to explore national curriculum of mathematics, 2006 at the secondary level and reported gaps in instructional design, and content implementation. Their study revealed minimum emphasizes on curriculum standards and skills, and neglected conceptual understanding, critical thinking, and the humanistic dimension of learning. Key domains like information handling and reasoning were less focused in assessment.

A recent international study by Folson & Awuah (2025) from Ghana analyzed the alignment between the pre-tertiary TVET Core Mathematics curriculum and national exit examinations using Webb's DOK framework. The study reported weak cognitive alignment: most exam items were at DOK Level-1 and Level-2, while DOK Level-4 was rare addressed. The representation across content domains was uneven, showing poor balance of representation and range-of-knowledge correspondence.

## Research Methodology

This study was a descriptive quantitative content analysis. The NC mathematics 2020 and the PEC tests 2023, and six reviewers were the primary sources of the data collection. The WAT V2 was used to measure the alignment between curriculum and assessment. The PEC developed and administered the mathematics standardized assessment at the elementary level. The NC mathematics 2020 and the PEC mathematics tests 2023, 8th-grade, were explored regarding standards and SLOs. Each SLO from the curriculum was matched with related assessment items to evaluate alignment. The DOK framework was used to measure cognitive levels in curriculum standards and test items. There were four DOK levels; level-1 (Recall), level-2 (Skill/Concept), level-3 (Strategic Thinking), and level-4 (Extended Thinking). The DOK ratings helped to determine whether assessment items matched the expected complexity of each SLO. The WAT v2 guided reviewers in scoring alignment based on four core criteria; categorical concurrence, DOK consistency, range-of- knowledge correspondence, and balance of representation. These criteria provided a systematic way to assess whether the assessment accurately reflected the content and thinking levels intended by the NC mathematics 2020. The WAT v2 was applied to guide the alignment process. The model evaluates alignment using four criteria: categorical concurrence, DOK Consistency, range-of-knowledge correspondence, and balance of representation. The DOK levels were assigned to the curriculum SLOs and assessment items, categorizing into four levels: level-1, level-2, Level-3, and level-4 of the Webb model (Webb,

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2007). The analysis is based on two core alignment criteria; categorical concurrence, which assesses whether content categories from the curriculum appear in the assessment, and DOK consistency, which measures whether the cognitive level of assessment items matches the expected complexity of the curriculum SLOs. Each SLO was compared with related PEC assessment items to determine representation and cognitive alignment. The reviewers assigned DOK levels and curriculum standards and test questions using Webb's four-level classification; recall skill/concept, strategic thinking, and extended thinking for measuring alignment. Alignment results generated through WAT v2 were analyzed and interpreted to identify patterns, gaps, or mismatches between the curriculum and assessment. During the review, some items could not be coded due to ambiguity, lack of clarity about the SLOs, or disagreement among reviewers. These items were flagged as un-coded because at least two reviewers did not assign a matching SLO.

The reliability of the study was assessed using the intra-class correlation coefficient calculated according to the method of Shrout and Fleiss. 1979, as cited by Webb, 2007. Intra-class correlation reliability must be greater than .7. The pair-wise benchmark for assessment is calculated by pairing the reviewers who have given the same DOK level to a particular assessment item. Their same responses are then added and divided by the total number of all possible pairs of reviewers. The value of .7 or higher represents a good agreement, whereas a value less than .5 is considered as bad agreement among reviewers (Webb, 2007).

**Table 1**

Intra-class Coefficient and pairwise Comparison

| Assessment Test | Grade | Intra Class Correlation | Pairwise Comparison | Obj. Pairwise Comparison |
|---|---|---|---|---|
| PEC | 8 | .99 | .98 | .72 |

Table 1 demonstrated that the intra-class correlation reliability for the 8th-grade PEC assessment was 0.99. The pair wise agreement among reviewers for DOK levels was 0.98, while the objective pair wise comparison yielded a value of 0.72, indicating strong consistency across reviewer judgments.

## Data Analysis and Interpretation

The data collected from reviewers and WAT v2 were analyzed according to the study objective.

**Table 2**

SLOs %age by DOK Levels in 8th-Grade Mathematics Curriculum

| Grade | DOKLevels | %age | by |
|---|---|---|---|

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| | | levels |
|---|---|---|
| | 1 | 5.88% |
| 8 | 2 | 32.35% |
| | 3 | 61.76% |
| | 4 | 0% |
| Total | | 100 |

Table 2 showed that DOK level-1 (5.88%), level-2 (32.4%), level-3 (61.7%), level-4, (0%) in mathematics. The results depicted less focus on DOK levels-1and DOK-4, 5.88% Recall and extended thinking, and a strong focused on focus on DOK levels-2and DOK-3, skill/concept, strategic thinking in mathematics.

**Table 3**

*% age of SLOs by DOK Levels in 8th-Grade Mathematics Textbook*

| Class | DOK Level | % age by Level |
|---|---|---|
| | 1 | 17.05 |
| 8 | 2 | 54.55 |
| | 3 | 27.27 |
| | 4 | 1.13 |
| Total | | 100 |

Table 3 showed that DOK level-1 (17.05%), level-2 (54.55%), level-3 (27.27%), and level-4 (1.13%) in mathematics. The results indicated that the majority of SLOs were concentrated on DOK level-2 (skills/concepts), followed by a considerable portion at DOK level-3 (strategic thinking). However, a comparatively lower proportion was observed at DOK level-1 (recall) and DOK level-4 (extended thinking). This reflects that the curriculum emphasizes skill development and application of concepts, while providing limited opportunities for recall-based tasks and extended higher-order reasoning in mathematics.

**Table 4**

Marks/Point Value in the assessment tool by PEC

| Point marks | Value/item | 1.5 | 5 | 5 | 5 | 5 | 6 | Total |
|---|---|---|---|---|---|---|---|---|
| Items | | 32 | 2 | 2 | 2 | 2 | 2 | 42 |

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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Total Value/Marks | Point | 48 | 10 | 10 | 10 | 10 | 12 | 100 |

Table 4 showed the PEC assessment marks distribution, with 32 out of 42 items carrying 1.5 marks. This dominance of low-mark items may limit the assessment of deeper understanding and extended problem-solving.

**Table 5**

Assessment Items Targeted to Curriculum SLOs

| Grade | Items | Total NC SLOs | Targeted SLOs | %age targeted | SLOs not targeted | %age not targeted |
|---|---|---|---|---|---|---|
| 8 | 42 | 68 | 33 | 48.5 | 35 | 51.5 |

Table 5 shows that there were total 68 SLOs in the NC mathematics from which 42 items included for assessment. Only 33(48.5%) SLOs were targeted, while 35(51.5%) SLOs were not targeted in the PEC assessment. Overall results depicted that less than 50% SLOs were included in the final test.

**Table 6**

Summary of Attainment of Acceptable Alignment Level on Four Content Focus Criteria as Rated by six Reviewers

| Standards | Alignment Criteria | | | |
|---|---|---|---|---|
| | Categorical Concurrence | Depth-of-Knowledge Consistency | Range of Knowledge | Balance of Representation |
| Numbers & Operations | YES | YES | WEAK | WEAK |
| Algebra | YES | YES | WEAK | WEAK |
| Measurement | NO | NT | NT | NT |
| Geometry | NO | NT | NT | NT |
| Statistics & Probability | NO | NT | NT | NT |

NT = Not Tested

Table 6 **Demonstrated** only numbers and algebra domains align across the first two criteria, while others fail or are untested. This indicates a narrow focus and poor content balance in curriculum implementation.

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**Table 7**

Range-of-Knowledge Correspondence and Balance of Representation between Standards and Assessment as Rated by Six Reviewers

| Reporting Category | | | Hits | | Range of Standards | | | | Range of Know | % of Hits of Total Hits | | Balance Index | | Bal of Rep. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Num Stds Hit | | % of Total | | | | | | | |
| Title | Dom Num | StdsNum | M | SD | M | SD | M | SD | | M | SD | M | SD | |
| Numbers & Operations | 1 | 48 | 66.5 | 0 | 22.6 | .52 | 47.2 | 1.08 | WEAK | 36 | 0 | .69 | .01 | WEAK |
| Algebra | 2 | 18 | 29 | 0 | 8 | 0 | 44.4 | 0 | WEAK | 14 | 0 | .63 | 0 | WEAK |
| Measurement | 0 | 0 | 0 | 0 | 0 | 0 | NaN | 0 | NT | 0 | 0 | N/A | 0 | NT |
| Geometry | 0 | 0 | 0 | 0 | 0 | 0 | NaN | 0 | NT | 0 | 0 | N/A | 0 | NT |
| Statistics &Probability | 0 | 0 | 0 | 0 | 0 | 0 | NaN | 0 | NT | 0 | 0 | N/A | 0 | NT |
| Total | 3 | 66 | 95.5 | 0 | 6.1 | 9.8 | NaN | 19 | | 10 | 16 | 0.66 | .19 | |

Table 7 revealed a significant imbalance in the assessment coverage. Only the numbers & operations and algebra domains were assessed, while the measurement, geometry, and statistics and probability domains were completely unrepresented. This indicated a narrow focus in the PEC mathematics assessment 8th-grade. Additionally, the appearance of NaN (Not a Number) values in the table, especially for the NT (not tested) standards, revealed missing data or inapplicable calculations due to zero coverage. This further confirms the lack of comprehensive domain representation in the assessment.

**Table 8**

Categorical Concurrence between Standards and Assessment rated Reviewers

| Reporting Category | | | Level by Standards | | | Hits | | |
|---|---|---|---|---|---|---|---|---|
| Title | Domain Number | Standard Number | Level | Num of Stds | % w/in RC by Level | Mean | SD | Categorical Concurrence |
| Numbers & | 1 | 48 | 1 | 4 | 8.3 | 66.5 | 0 | YES |

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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Operations | | | 2<br>3 | 23<br>21 | 47.9<br>43.7 | | | |
| Algebra | 2 | 18 | 2<br>3 | 1<br>16 | 5.8<br>94.2 | 29 | 0 | YES |
| Measurement | 0 | 0 | 2 | 1 | 100 | 0 | 0 | NO |
| Geometry | 0 | 0 | 2 | 1 | 100 | 0 | 0 | NO |
| Statistics & Probability | 0 | 0 | 3 | 1 | 100 | 0 | 0 | NO |
| Total | 3 | 66 | 1<br>2<br>3 | 4<br>26<br>38 | 6<br>38<br>56 | 95.5 | 0 | |

Table 8 demonstrated alignment between categorical concurrence and SLOs for standards numbers & operations, and algebra. However, there is no alignment between categorical concurrence and SLOs for the measurement, geometry, and statistics & probability. This showed that assessment did not fully represent the SLOs outlined in the NC across all standards and reflected a gap. This represents partial alignment and a lack of comprehensive coverage of the curriculum.

**Table 9**

Alignment between Standards and DOK Levels Consistency Rated by Reviewers

| Reporting Category | | | Hits | | DOK Level of Item | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Standards | Domain Num | Std Num | M | SD | % Under | SD | % At | SD | % Above | SD | DOK Consistency |
| Numbers & Operations | 1 | 48 | 66.5 | 0 | 6.77 | 0 | 23.7 | 1 | 69.55 | 1 | YES |
| Algebra | 2 | 18 | 29 | 0 | 15.5 | 0 | 56.9 | 0 | 27.59 | 0 | YES |
| Measurement | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | NT |
| Geometry | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | NT |
| Statistics & Probability | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | NT |

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| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Total | 3 | 66 | 95.5 | 0 | 9.42 | 0 | 33.77 | 0.6 | 56.81 | 0.6 |

Table 9 showed alignment between standards and DOK Levels consistency. The standard numbers and operations comprise 23.7%, algebra15.52%. The standard of measurement, geometry, and statistics & probability were NT (not tested) PEC assessment.

Table 10

% age by DOK Levels in Curriculum, Textbook and Assessment 8th- Grade Mathematics

| DOK Level | Curriculum (%) | Textbook (%) | Assessment (%) |
|---|---|---|---|
| Level 1 | 5.88% | 17.05% | 16.67% |
| Level 2 | 32.35% | 54.55% | 71.43% |
| Level 3 | 61.76% | 27.27% | 11.90% |
| Level 4 | 0% | 1.13% | 0% |
| **Total** | 100% | 100% | 100% |

Table 10 showed that the curriculum contained DOK level-1 (5.88%), level-2 (32.35%), level-3 (61.76%), and level-4 (0%). The textbook contained DOK level-1 (17.05%), level-2 (54.55%), level-3 (27.27%), and level-4 (1.13%). The assessment contained DOK level-1 (16.67%), level-2 (71.43%), level-3 (11.90%), and level-4 (0%). The results indicated that the curriculum emphasized higher-order thinking at DOK level-3, while the textbook mainly focused on DOK level-2. However, the assessment showed a strong concentration at DOK level-2 with limited representation of DOK level-3. Minimal representation was observed at DOK level-1 and DOK level-4 across curriculum, textbook, and assessment.

**Results**

The study was framed to explore the alignment of Depth-of-Knowledge (DOK) levels between the 8th-grade mathematics curriculum under NC 2020 and its prescribed textbook. The results from the curriculum indicated that out of 68 SLOs, DOK Level-1, 4(5.88%), Level-2, 22(32.35%), Level-3, 42(61.76%), while no SLO was classified at level-4. This distribution highlighted limited emphasis on recall tasks and complete absence of extended thinking, whereas a strong concentration was observed at the levels of skill/concept and strategic thinking.

On the other hand, the textbook analysis presented a different pattern with a total of 88 SLOs. Among them, Level-1, 15(17.05%), Level-2, 48(54.55%), Level-3, 24(27.27%), and Level-4, 1(1.13%). These results depicted that the textbook placed greater focus on recall and procedural tasks compared to the curriculum, while the representation of strategic thinking was relatively reduced. Although the inclusion of a few items at level-4 showed some effort toward extended thinking, the proportion remained negligible.

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Overall, the comparison revealed misalignment between the curriculum and textbook in terms of DOK level distribution. While the curriculum emphasized higher-order cognitive engagement at level-3, the textbook prioritized mid-level procedural skills at level-2, with disproportionate representation across levels. This imbalance suggests the need for more coherent integration of DOK levels in textbook development to ensure that the intended rigor of the curriculum is effectively reflected in instructional materials.

## Conclusions

The study results concluded that there is weak alignment between the curriculum standards and the 8th-grade mathematics textbook. Curriculum standards related to numbers and operations, and algebra were covered in the textbook, but there was little or no representation of measurement, geometry, and statistics and probability. This imbalance shows that the textbook does not fully reflect the breadth of the curriculum, which may affect students' opportunities to achieve all intended learning outcomes.

## Discussion

This study was conducted to analyze the extent of alignment between the NC mathematics curriculum and the PEC 8th-grade assessment. Findings revealed that only 48.5% of the curriculum SLOs were addressed, while 51.5% were overlooked, showing weak representation of measurement, geometry, and statistics. Most items targeted DOK levels-2 and 3, while levels-1 and 4 remained underrepresented, indicating gaps in both basic recall and extended thinking skills. These results are consistent with Gulzar and Mahmood (2019), who also reported weak alignment and a lack of higher cognitive coverage in mathematics at the secondary level. Similarly, Khurshid (2023) highlighted partial alignment in science where higher-order thinking was minimally assessed. Comparable findings were reported internationally by **Folson and Awuah (2025) in Ghana**, who found that national mathematics exit examinations were dominated by DOK Level-1 and Level-2 items, with no assessment of DOK Level-4, reflecting the same global challenge of insufficient higher-order thinking assessment. Such evidence suggests that both locally and internationally, curriculum–assessment alignment struggles to fully reflect the intended depth and breadth of learning outcomes.

## Recommendations

On the basis of the results of the study, it is recommended that curriculum writers ensure proper alignment between the curriculum and the textbooks. During the development process of SLOs, curriculum makers may focus on minimizing the gaps observed in previous versions, so that the intended learning outcomes are consistently reflected in teaching materials and assessments.

## Reference

Anderson, J. (2009). *Mathematics curriculum development and the role of problem solving. ACSA Conference*, 1(1), 1–8. Australian Curriculum Studies Association

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EDUCATIONAL RESEARCH AND INNOVATION (ERI)
e-ISSN:2710-4354
p-ISSN:2076-9660
Received: 12/02/2026 Accepted: 20/03/2026

Church, A. (1940). ET Bell. The development of mathematics. McGraw-Hill Book Co., New York and London1940, xiii+ 583 pp. *The Journal of Symbolic Logic*, *5*(4), 152-153.

Crawford, D. B., & Snider, V. E. (2000). Effective mathematics instruction: The importance of curriculum. *Education and Treatment of Children*, 23(2), 122–142.

CCSSO.(2002). Models for alignment analysis and related issues. *Council of Chief State School Officers*. Retrieved from http://www.ccsso.org

Folson, D., & Awuah, F. K. (2025). Assessing Cognitive Alignment in Pre-Tertiary TVET Core Mathematics: A Ghanaian Case Study of Curriculum and Exit Examination. *East African Journal of Education Studies, 8*(2), 176–188. https://doi.org/10.37284/eajes.8.2.2886

Government of Pakistan. (2020). Single National Curriculum: Mathematics—Grade VIII. Ministry of Federal Education and Professional Training.

Gulzar, M. A., & Mahmood, K. (2019). Alignment between the secondary school mathematics curriculum and assessment: A study of BISE Lahore. *Bulletin of Education and Research, 41(*2), 43–60.

Hashmi, S. H., Hussain, S., & Shoaib, A. (2018). Evaluation of mathematics textbook of grade VIII on the basis of national curriculum. *Bulletin of Education and Research*, 40(2), 125–138.

Iqbal, A., Abbas, N., & Abbas, F. (2024). Teachers' perceptions of the implementation of the Single National Curriculum for mathematics at grade 5. *Journal of Education and Educational Development*, 11(1), 112–130.

Johansson, M. (2003). Textbooks in mathematics education: A study of textbooks as the potentially implemented curriculum (Doctoral dissertation, Luleå university of technology).

Khansa, U., & Haq Nawaz. (2025). Measuring alignment between single national curriculum english 2020 standards and Punjab examination commission assessment 2023–2024. *Contemporary Journal of Social Science Review, 3(*2), 3016–3020. https://doi.org/10.63878/cjssr.v3i2.1018

Khurshid, A. (2023). Alignment between SNC 2022 science standards and PEC 2023 assessments. *Contemporary Journal of Social Science Review, 2(*4), 101–120.

Malik, S. A., Ch, M. S., Batool, Z., & Mahmood, S. (2023). Challenges and opportunities in implementation of Single National Curriculum: A qualitative inquiry. *Journal of ISOSS*, 9(1), 85–98.

National Council of Teachers of Mathematics (NCTM). (2000). Principles and standards for school mathematics. NCTM.

Ornstein, A. C., & Hunkins, F. P. (2018). Curriculum: Foundations, principles, and issues (8th ed.). Pearson.

Vol. 6, No. 1 (2026)
EDUCATIONAL RESEARCH AND INNOVATION (ERI)
e-ISSN:2710-4354
p-ISSN:2076-9660
Received: 12/02/2026 Accepted: 20/03/2026

Prideaux, D. (2003). Curriculum design. BMJ, 326(7383), 268–270. https://doi.org/10.1136/bmj.326.7383.268

Polikoff, M. S. (2012). The SEC model of alignment: Evidence from three states. Educational Measurement: Issues and Practice, 31(4), 27–37. https://doi.org/10.1111/j.1745-3992.2012.00252.x

Rezat, S., Fan, L., & Pepin, B. (2021). Mathematics textbooks and curriculum resources as instruments for change. ZDM–Mathematics Education, 53(6), 1189–1206. https://doi.org/10.1007/s11858-021-01256-1

Riaz, H., & Shah, S. Z. (2019). The alignment between curriculum and textbooks: An analysis of elementary level mathematics textbooks in Pakistan. *Bulletin of Education and Research*, 41(3), 89–108.

Rind, I. A., & Mughal, M. J. (2020). Exploring Pakistan's national curriculum of mathematics: A critical analysis. *Journal of Research in Social Sciences*, 8(1), 45–59.

Thijs, A., & van den Akker, J. (2009). Curriculum in development. Netherlands Institute for Curriculum Development (SLO).

Webb, N. L. (2007). Issues related to judging the alignment of curriculum standards and assessments. Applied Measurement in Education, 20(1), 7–25. https://doi.org/10.1080/08957340709336728

Young, M. (2014). What is a curriculum and what can it do? Curriculum Journal, 25(1), 7–13. https://doi.org/10.1080/09585176.2013.875774

Zaman, M. S., Saleem, K., & Ali, S. (2021). Implementation of the Single National Curriculum (SNC) at primary level: *Teachers' expectations and concerns. Jahan-e-Tahqeeq*, 4(4), 161–168.