Original Research Article

ANALYZING THE CHALLENGES FACED BY CBSE CLASS X STUDENTS IN MAHARASHTRA IN SOLVING ASSERTION-REASONING TYPE SCIENCE QUESTIONS IN ALL INDIA SECONDARY SCHOOL EXAMINATION 2024–25

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Abstract:

Assertion-Reasoning (A–R) type questions have been incorporated into CBSE assessments to evaluate students' higher-order cognitive skills, particularly their ability to analyze, reason, and make logical connections between concepts. These questions are designed to move beyond rote learning and encourage students to engage in critical thinking and evidence-based reasoning. However, preliminary classroom observations and board examination results suggest that students are struggling with this format. This study aims to investigate the specific challenges faced by CBSE Class X students in Maharashtra while answering A–R questions in the Science paper during the All India Secondary School Examination (2024–25).

A total of 300 answer booklets from English-medium schools were analyzed to assess student performance on the four A–R questions included in the paper. The data revealed that a significant majority of students scored below average, with over 57% obtaining less than 2 out of 4 marks. These results highlight a concerning gap in students' logical aptitude and suggest that current teaching strategies may not adequately prepare them for such assessments. The paper discusses the implications of these findings and provides recommendations for integrating reasoning-based pedagogy, improving teacher training, and redesigning classroom practices to better align with competency-based assessment formats.

Introduction:

In recent years, educational boards and policymakers in India have shifted their focus from traditional rote-based learning toward competency-based education. One significant step in this direction is the introduction of Assertion-Reasoning (A–R) type questions, particularly in the Central Board of Secondary Education (CBSE) curriculum. These questions aim to test students' analytical skills, conceptual clarity, and ability to connect scientific facts with logical reasoning. A–R questions present a statement of assertion followed by a reason, and students are required to evaluate the correctness of both as well as the logical relationship between them. This format is designed to foster critical thinking and discourage rote memorization.

However, despite the well-intentioned implementation of such innovative question formats, classroom-level evidence and examination performance suggest that students are finding A–R questions particularly challenging. The challenge is not limited to understanding the scientific content but extends to processing the logical structure of the question itself. This trend raises critical concerns about whether students are being adequately trained in reasoning and analytical skills during their foundational years.

The problem becomes more evident when examining board exam performance, where A–R questions are often poorly attempted, and scores reflect a lack of confidence or clarity among students. This research seeks to analyze these challenges specifically in the context of CBSE Class 10 Science examinations in

Maharashtra for the academic year 2024–25. By focusing on Maharashtra, a state with a large number of CBSE schools, this study provides insights into broader trends within India's secondary education system. The study also explores the implications of these trends on teaching methodologies, curriculum delivery, and assessment design.

Review of Related Literature:

The increasing inclusion of higher-order thinking questions in educational assessments is rooted in foundational theories of learning and cognition. Bloom's Taxonomy (1956) laid the groundwork for categorizing educational goals, placing 'evaluation' and 'synthesis' at the apex of cognitive development. Assertion-Reasoning (A–R) questions directly correspond to these higher levels, as they require students not just to recall knowledge, but to analyze relationships between concepts.

Anderson and Krathwohl (2001) revised Bloom's taxonomy to reflect modern learning goals, emphasizing cognitive processes such as analyzing, evaluating, and creating. Their work has been widely applied in curriculum design, particularly for competency-based education models such as those endorsed by the National Education Policy (NEP) 2020. However, despite the policy-level emphasis, implementation in the classroom has been uneven. Marzano (2003) emphasized that the acquisition of reasoning skills must be deliberate and continuous. According to his framework, metacognition and self-regulated learning are essential for developing logical aptitude—skills that many students lack due to the continued focus on factual recall in classrooms.

Resnick (1987) highlighted that reasoning is not naturally acquired but must be explicitly taught through active engagement and problem-solving opportunities. Similarly, Zohar and Dori (2003) demonstrated that with proper scaffolding, even low-achieving students can develop higher-order thinking skills, challenging

the assumption that logical reasoning is limited to high performers.

Paul and Elder (2008) stressed the importance of explicit critical thinking instruction in secondary education. They argue that critical reasoning must be a routine part of the learning process, not an occasional exercise reserved for examination settings.

Furthermore, Halpern (2014) provided a psychological perspective on thinking and knowledge construction, underscoring the role of inference, logic, and causal analysis in science education. Her work suggests that when students are not taught how to reason systematically, they struggle to answer complex question formats like A–R.

King, Goodson, and Rohani (2011) proposed that the integration of higher-order thinking skills (HOTS) into daily instruction demands a shift in classroom practices. Teachers need training to develop assessments that reflect such skills and instructional materials that offer guided reasoning tasks.

In the Indian context, CBSE has taken initial steps toward implementing HOTS in its assessments, particularly in Science and Mathematics. However, as observed in the current study, the transition remains incomplete at the instructional level. Many teachers report a lack of understanding among students for structured reasoning tasks.

This literature reveals a gap between educational theory and classroom practice. While the theoretical framework for developing logical aptitude is well-established, its practical application in Indian secondary schools—particularly with regard to A–R questions—remains limited. This gap necessitates targeted pedagogical interventions, aligned assessment design, and teacher professional development.

Objectives of the Study:

- To analyze the performance of CBSE Class 10 students in Maharashtra in answering assertion-

reasoning type questions in the Science Board Exam (2024–25).

- To identify the specific difficulties students face while attempting these questions.
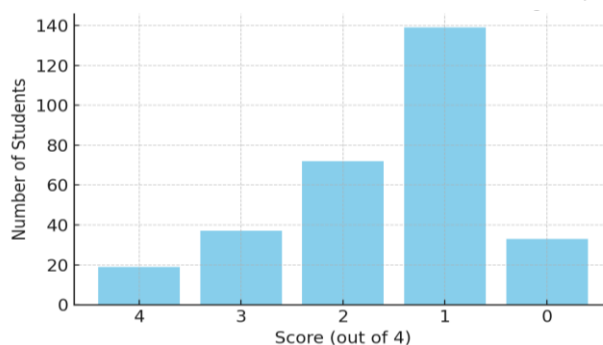- To recommend pedagogical strategies to improve student performance in assertion-reasoning based questions.

Hypotheses:

- H1: The majority of students score less than 2 out of 4 marks in assertion-reasoning questions.
- H2: There exists a significant gap between students' conceptual understanding and logical reasoning skills required for A–R questions.

Results and Interpretation:

The following analysis is based on data collected from actual answer booklets of 300 students:

Methodology:

This study adopts a descriptive survey methodology, using actual board examination data as the core sample. A total of 300 answer booklets of CBSE Class X students from English-medium CBSE schools in Maharashtra were analyzed. These answer booklets were selected using stratified purposive sampling. Each answer script was evaluated based on the student's responses to the four assertion-reasoning questions in the Science paper.

Quantitative methods such as frequency distribution, percentage analysis, mean, and standard deviation were applied to draw meaningful interpretations.

Figure 1. *Score Distribution in Assertion-Reasoning Questions*

Table 1. *Distribution of Student Scores in Assertion-Reasoning Questions*

Score (out of 4)	Number of Students	Percentage (%)
4	19	6.33%
3	37	12.33%
2	72	24.00%
1	139	46.33%
0	33	11.00%
Total	300	100%

Statistical Summary:

Mean Score: 1.57

Standard Deviation: 1.05

Interpretation:

The data clearly show that the majority of students are scoring very low in A–R type questions. Only 6.33% achieved a full score, while a striking 46.33% scored only one mark, and 11% failed to score at all. This demonstrates a major disconnect between instruction and the reasoning demands of the questions. The standard deviation suggests that student scores are widely dispersed, implying inconsistency in reasoning skills even among similar academic backgrounds.

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Discussion:

The underperformance in A–R questions, despite student proficiency in content knowledge, is a reflection of how the reasoning process is taught and reinforced. Most schools continue to follow traditional teaching models that prioritize content delivery over logical development. Assertion-Reasoning questions require not just content recall but mental habits of evaluating and connecting information—a skill that takes time and practice to develop. It is essential to align pedagogical practices with assessment reforms. Teachers require training not just in preparing students for these questions, but also in modeling reasoning strategies themselves. Curriculum and textbooks also need revision to embed such formats regularly, rather than sporadically.

Conclusion and Recommendations:

This study highlights a critical need to revisit how logical aptitude and reasoning are developed in secondary education. The poor performance on assertion-reasoning questions among CBSE Class 10 students in Maharashtra underscores the gap between assessment design and instructional practice. A transition to higher-order assessments must be matched with foundational support for students.

Recommendations

- Incorporate A–R type questions in class assessments regularly.
- Conduct reasoning-skills workshops for both students and teachers.
- Use visual tools such as concept maps to foster logical links.
- Provide continuous training for science educators on question interpretation and guided reasoning techniques.

The findings of this study are valuable for policymakers, educators, and curriculum developers working toward competency-based education in India.

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