ISSN Online: 3006-4708
ISSN Print: 3006-4694
SOCIAL SCIENCE REVIEW ARCHIVES
https://policyjournalofms.com

A Comparative Analysis of Federal Board Grade 6 Science Textbook and Balochistan Textbook of Pakistan

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DOI: https://doi.org/10.70670/sra.v4i1.2147

Abstract
The Grade 6 Science curriculum plays a significant role in developing scientific literacy, conceptual understanding, and critical thinking among middle school students in Pakistan. This review presents a comparative analysis of the Grade 6 Science textbooks published by the Federal Board through the National Book Foundation (NBF) and the Balochistan Textbook Board (BTBB). The study evaluates both textbooks in terms of curricular alignment, content organization, pedagogical approaches, instructional design, assessment strategies, and integration of technology. The Federal Board textbook demonstrates a modern inquiry-based and competency-oriented approach aligned with the Single National Curriculum (SNC) and National Curriculum of Pakistan (NCP) 2022. It emphasizes critical thinking, practical applications, Higher-Order Thinking Skills (HOTS), STEAM education, and digital learning through QR codes and multimedia integration. In contrast, the Balochistan textbook adopts a more descriptive and content-intensive style, focusing on foundational scientific knowledge, detailed explanations, technical rigor, and extensive conceptual coverage. The comparison further reveals differences in the treatment of biological sciences, physical sciences, measurement concepts, forces, energy, and assessment methodologies. While the Federal Board prioritizes conceptual understanding and inquiry-based learning, the Balochistan Board emphasizes factual mastery, diagrammatic representation, and structured taxonomy. The review also explores sociocultural dimensions such as religious integration, gender sensitivity, regional accessibility, and implementation challenges associated with teacher training and resource availability. Despite their methodological differences, both textbooks contribute significantly to science education within their respective educational contexts. The study concludes that integrating the technological innovation and inquiry-based strategies of the Federal Board with the conceptual depth and foundational rigor of the Balochistan Board could improve the overall quality of science education and strengthen the implementation of a unified national curriculum in Pakistan.

Keywords: Grade 6 Science; Federal Board; Balochistan Textbook Board; Single National Curriculum; Science education; Inquiry-based learning; Curriculum comparison; Pedagogical approaches; Textbook analysis; Pakistan education system

Introduction
The educational infrastructure of Pakistan is fundamentally shaped by the interplay between centralized curricular mandates and provincial textbook development. Following the Eighteenth Constitutional

Amendment, which devolved education to the provinces, and the subsequent efforts toward a Single National Curriculum (SNC), the development of science textbooks for Grade 6 has become a critical focal point for measuring curricular alignment and pedagogical reform (Shah, 2019). The Grade 6 General Science textbooks produced by the National Book Foundation (NBF) for the Federal Board and the Balochistan Textbook Board (BTBB) represent two distinct institutional responses to the national vision of fostering scientific literacy and critical thinking. While both boards operate under the umbrella of the National Curriculum, their stylistic choices, content density, and instructional methodologies reflect divergent pedagogical philosophies and regional contexts (Tayyab et al., 2022).

The transition from the previous decentralized models toward a more cohesive national standard represents one of the most significant shifts in Pakistani educational policy. Science education at the Grade 6 level serves as a bridge between foundational primary concepts and the more complex specialized sciences introduced in secondary school (Munawar et al., 2024). This analysis provides a comparative overview of how the Federal and Balochistan boards interpret these requirements through content selection, physical presentation, and evaluative methods. Despite the unifying intent of the SNC to bridge educational disparities across public, private, and religious institutions, implementation remains challenged by regional resource constraints and varying levels of teacher preparedness (Panjwani & Chaudhary, 2022).

2. Institutional Framework and Strategic Curricular Alignment

The National Book Foundation (NBF), acting as the primary publisher for the Federal Board of Intermediate and Secondary Education (FBISE), serves a unique role in Pakistan's educational ecosystem. As a federal entity, the NBF is often the first to implement large-scale curricular shifts, such as the transition to the Single National Curriculum (SNC) 2020 and the more recent National Curriculum of Pakistan (NCP) 2022 (Kanwal, 2022). The Federal Board's approach is characterized by a commitment to modernizing education through the integration of digital resources and an inquiry-based pedagogical framework. The NBF Grade 6 Science textbook is structured to facilitate a transition from basic observations to complex scientific inquiry, emphasizing the "nature of science" as a process of asking questions like "how," "what," "where," and "why" (Naseer et al., 2016).

In contrast, the Balochistan Textbook Board (BTBB) operates within a framework that balances the requirements of the National Curriculum 2006 with the emerging demands of the SNC (Asad et al., 2023). The BTBB has historically been noted for providing textbooks that are highly detailed and extensive, often covering vast portions of text that are necessary for building a robust foundational knowledge in the sciences. Despite facing significant geographical and financial challenges in distribution, the BTBB has focused on delivering foundational learning materials that are gender-responsive and grade-appropriate, facilitating self-study for students who may have limited access to classroom instruction (Kakar, 2022).

Table 1: Institutional Comparison of Federal and Balochistan Boards

Institutional Factor	Federal Board (National Book Foundation)	Balochistan Textbook Board (BTBB)
Core Curricular Basis	Single National Curriculum (SNC) / NCP 2022	National Curriculum 2006 / SNC Transition
Primary Pedagogical Aim	Inquiry-based, STEAM, 21st-century skills	Content-detailed, descriptive, foundational depth
Distribution Reach	Centralized federal institutions and ICT	Province-wide across Balochistan; used in some federal schools
Media Integration	QR codes, video lessons, and online assessments	Physical text focus; mobile app for offline access

Update Frequency	High; frequent revisions to align with global trends	Periodic; focused on extensive subject coverage

The alignment of these textbooks with the National Curriculum is not merely a bureaucratic requirement but a strategic effort to promote social cohesion. By exposing students across different provinces to the same curricular content, the federal government aims to reduce fragmentation and inequalities within Pakistan's school system. However, the enactment of this unified approach involves complex comparative-historical factors, where standardized assessments like TIMSS influence the de facto measurement of quality education. Both boards strive to meet these standards, yet the local implementation reflects the specific strengths and constraints of their respective institutional backgrounds (Akhter, 2013).

3. Structural Organization and Scope of Content

The structural arrangement of the Grade 6 Science curriculum in both the Federal and Balochistan boards reveals a parallel twelve-chapter layout, yet the internal prioritization of topics reflects distinct scientific emphases. The Federal Board Grade 6 Science textbook (NBF) focuses heavily on physiological processes and technological applications, while the Balochistan textbook (BTBB) provides a more granular exploration of anatomy and environmental interactions (Rubab et al., 2021).

3.1 Life Science and Biological Hierarchy

The biological science component in the Federal textbook begins with "Cellular Organization," establishing the cell as the structural and functional unit of living organisms. This chapter moves rapidly from cellular structures to organ systems, such as the human digestive and respiratory systems, emphasizing the hierarchy of life. A critical feature of the NBF approach is its focus on "Balanced Diet" and nutrition, linking biological systems to fitness and health—a theme consistent with modern health-conscious educational trends (National Curriculum of General Science, 2006; NBF, 2020).

The Balochistan textbook, conversely, offers an exceptionally detailed treatment of "Sense Organs" in Chapter 2, a topic that is often integrated into broader systems in other curricula. This chapter provides exhaustive detail on the nose, tongue, ear, eye, and skin. For instance, in the study of the tongue, students are not only taught the function of taste but are guided through activities to identify the specific zones for sweet, sour, bitter, and salty tastes (BTBB, 2021). Furthermore, the BTBB textbook provides a highly technical breakdown of the light microscope, listing ten distinct parts including the eyepiece, body tube, adjustment screws, nosepiece, objective lenses, arm, stage, clips, and diaphragm. This level of descriptive detail is a hallmark of the Balochistan Board's pedagogy, aimed at providing a comprehensive reference for the student (SED, 2020).

Table 2: Comparison of Chapter Content Prioritization

Chapter Number	Federal Board (NBF) Content	Balochistan Board (BTBB) Content
1	Cellular Organization (Animal/Plant Comparison)	Cellular Organization (Microscope Focus)
2	Reproduction in Plants	Sense Organs (Detailed Anatomy)
3	Balanced Diet and Nutrition	Photosynthesis and Respiration
4	Human Digestive System	Environment and Interactions
5	Matter as Particle	Atoms, Molecules, Mixtures, Compounds
6	Elements and Compounds	Air (Composition and Properties)
7	Mixtures (Separation Techniques)	Solutions and Suspensions

8	Energy (Forms and Conservation)	Energy and its Forms (Kinetics/Potential)
9	Electricity (Static and Current)	Forces and Machines (Pulleys/Gears)
10	Magnetism (Electromagnets)	Properties of Light (Reflection/Mirrors)
11	Technology in Everyday Life	Investigating Sound
12	Solar System (Planets and Satellites)	Space and Satellites (Milestones)

The treatment of plant biology also shows divergence. While the Federal Board combines photosynthesis with broader ecological themes, the Balochistan textbook dedicates a full chapter to "Photosynthesis and Respiration in Plants," detailing the internal structure of the leaf and the abiotic factors affecting food production. This granular focus ensures that students understand the chemical mechanics of plant life before progressing to broader environmental interactions (Ministry of Education, 2006).

3.2 Physical Science: Matter, Atoms, and Chemical Systems

In the domain of physical sciences, the Federal Board textbook adopts a modern "Matter as Particle" approach, which is heavily aligned with the Single National Curriculum (SNC) goals of inquiry-based learning (Ministry of Federal Education and Professional Training, 2023). This framework introduces students to the particle theory of matter, diffusion, and the interconversion of states—solid, liquid, and gas—through the lens of kinetic energy. The emphasis is on building a mental model of how particles behave, which allows students to explain everyday phenomena like evaporation and cooling effects (Nosheen et al., 2018).

The Balochistan textbook structures its physical science content through more traditional classifications: "Atoms, Molecules, Mixtures, and Compounds," followed by dedicated chapters on "Air" and "Solutions and Suspensions". The chapter on "Air" is particularly extensive, covering the importance of air, the properties of specific gases like nitrogen and oxygen, and their relationship with the atmosphere's overall composition (Pattnaik et al., 2012). Similarly, the "Solutions and Suspensions" chapter introduces the particle model specifically within the context of aqueous solutions, distinguishing between dilute, concentrated, saturated, and unsaturated solutions. This traditional categorical approach provides a structured chemical foundation that is useful for taxonomic understanding of substances (Hagiya et al., 2014).

The treatment of "Mixtures" in the Federal Board text is more focused on separation techniques, such as filtration, crystallization, and the use of magnets, which are presented as practical problems for students to solve. This problem-solving orientation contrasts with the more descriptive "Classification of Elements" and "Properties of Gases" found in the Balochistan text (Balochistan Textbook Board, 2021).

4. Physics Strand: Measurement, Forces, and Energy

The physics components of the Grade 6 Science textbooks serve as the students' first formal introduction to the quantitative laws of nature. Both boards prioritize measurement as a foundational skill, yet the Federal Board places higher emphasis on the philosophical nature of science, whereas the Balochistan Board focuses on the technical precision of scientific instruments (National Book Foundation, 2022).

4.1 Physical Quantities and the International System of Units

The Federal Board Grade 6 Science curriculum introduces students to physical quantities defined as any measurable property and the International System of Units (SI). Students are expected to distinguish between base quantities (length, mass, time, temperature, current, amount of substance, and intensity of light) and derived quantities (area, volume, velocity, and force). The instructional narrative emphasizes that derived quantities are obtained through the product or quotient of base units (National Curriculum Council,

2020).
The Balochistan textbook provides a rigorous technical overview of measurement tools. In its physics-oriented chapters, it details the use of Vernier callipers and screw gauges, specifying their "least count" in both millimeters (mm) and centimeters (cm) (Khokhar & Muhammad, 2022). This quantitative rigor is further exemplified by exercises requiring students to convert various quantities into scientific notation, such as the age of a student into seconds or the mass of a neutron (1.675 \times 10^{-27} kg) into milligrams. The inclusion of dimensional homogeneity the principle that all terms in a physical equation must have the same dimensions prepares Balochistan students for the more advanced Physics-11 curriculum (Gentili, 2018).
Mathematical models introduced in these chapters often include the following relations:

- Density: \rho = \frac{m}{V}
- Force: F = ma
- Scientific Notation: A \times 10^n

Table 3: Measurement Concepts and Instrument Emphasis

Measurement Concept	Federal Board (NBF) Emphasis	Balochistan Board (BTBB) Emphasis
Base Quantities	Length, Mass, Time (Foundational)	Detailed list of all 7 SI base units
Instruments	Ruler, Balance, Stopwatch	Vernier Callipers, Screw Gauge, Metre Rule
Errors	Emphasis on reducing random errors	Focus on Zero Error and Least Count
Calculations	Simple conversions and unit identification	Complex scientific notation and 10 prefixes
Accuracy	Consistency and precision in measurement	Numerical uncertainty and significant figures

4.2 Forces, Machines, and Energy Transfer

The Federal Board textbook's treatment of energy is built around the "Law of Conservation of Energy," which states that energy is neither created nor destroyed but transformed. The curriculum explores various forms of energy mechanical, thermal, chemical, electrical, and solar and their practical conversions. For example, the text explains how a smartphone uses electronics and electromagnetic waves to transfer energy and information (Muzaffar & Javaid, 2018).
The Balochistan textbook approaches these concepts through "Forces and Machines" and "Properties of Light". The machines chapter introduces students to the mechanical advantage of simple devices like the wheel and axle, pulleys (and their types), and gears. This mechanical focus is highly practical, showing how these principles apply to daily tasks like lifting heavy objects or the operation of a bicycle (Akhtar et al., 2021). In the chapter on light, students explore the laws of reflection and the formation of images by plane, concave, and convex mirrors. This detailed optical study includes the construction of a pinhole camera and a kaleidoscope, encouraging a hands-on understanding of how light interacts with surfaces (Raiz et al., 2024).

5. Pedagogical Delivery and Instructional Design

The pedagogical effectiveness of a science textbook is determined by how well it translates complex ideas into a language and format that 6th-grade students can comprehend. The Federal Board (NBF) and Balochistan Board (BTBB) utilize different instructional designs to achieve this goal, with the Federal Board leaning toward inquiry-based experiential learning and the Balochistan Board toward detailed descriptive instruction (Alpaslan et al., 2015).

5.1 Activities and Experimental Science

A hallmark of the Federal Board's Grade 6 Science textbook is the chapter "Technology in Everyday Life." This chapter is designed to bridge the gap between classroom science and the real world (Tayyab et al., 2022). Key activities include:

- **Earthen Pot Gardening:** Applying botanical knowledge to home gardening.
- **Food Biotechnology:** The "Tummy Treat" activity involving the formation of yogurt and cheese, which teaches students about fermentation and the role of microorganisms in the food industry.
- **Electrical Circuits:** The "Join the Circuit" activity, where students must physically assemble a working electrical path, fostering problem-solving skills in physics (Hill, 2024).

The Balochistan textbook emphasizes activities that reinforce sensory and biological observation. For instance, the "Taste Test" activity requires students to map the tongue, while "Microscopic Observation" exercises involve preparing slides of onion peel and cheek cells. These activities are integrated into the descriptive text, ensuring that students have a hands-on reference for the anatomical details they are learning. The BTBB text also includes activities for "Measurement Exercises," where students use scientific tools like measuring cylinders and thermometers to gather empirical data (Munawar et al., 2024).

5.2 Language and Visual Aids

The Grade 6 Science textbooks for both boards are primarily available in English (English Medium), though Urdu editions are produced to ensure wider accessibility in rural and diverse linguistic regions. The language in the NBF textbook is generally conversational and engaging, often starting chapters with real-life stories or questions to spark "Curiosity" a term that has become central to the new science pedagogy (National Curriculum Council, 2023).

Visually, both boards utilize a mix of realistic illustrations (photographs and drawings) and conventional illustrations (graphs, diagrams, and symbols). Realistic illustrations are used to help students identify with everyday objects, while conventional illustrations are essential for teaching abstract concepts like atomic structure or the solar system (National Book Foundation, 2024). The NBF textbook has made significant strides in incorporating QR codes in each chapter, which link students to digital content, video lessons, and online quizzes through platforms like Sabaq.pk. This digital integration is a major differentiator, providing a "blended learning" environment that caters to different learning styles (Ministry of Federal Education and Professional Training, 2023).

While the BTBB textbooks have faced historical criticisms regarding the quality of paper and binding, recent efforts have focused on ensuring that these books are durable and culturally relevant. The BTBB has also developed a mobile application that allows students to download and access all textbooks offline, which is a critical resource for students in Balochistan who face financial or geographical limitations in accessing physical books (World Bank, 2024).

Table 4: Pedagogical and Digital Feature Comparison

Instructional Feature	Federal Board (NBF) Approach	Balochistan Board (BTBB) Approach
Introductory Hook	Real-life stories and "Curiosity" questions	Definition-heavy introductions and "Key Points"
Experimentation	Integrated "Technology in Everyday Life"	Lab-style "Activities" following descriptive text
Visual Strategy	Heavy use of infographics and QR codes	Detailed anatomical diagrams and machine models

Digital Resources	High integration with video platforms (Sabaq.pk)	Offline-accessible mobile app for book storage
Workload	166 videos covering 12 chapters	193 videos covering 12 chapters

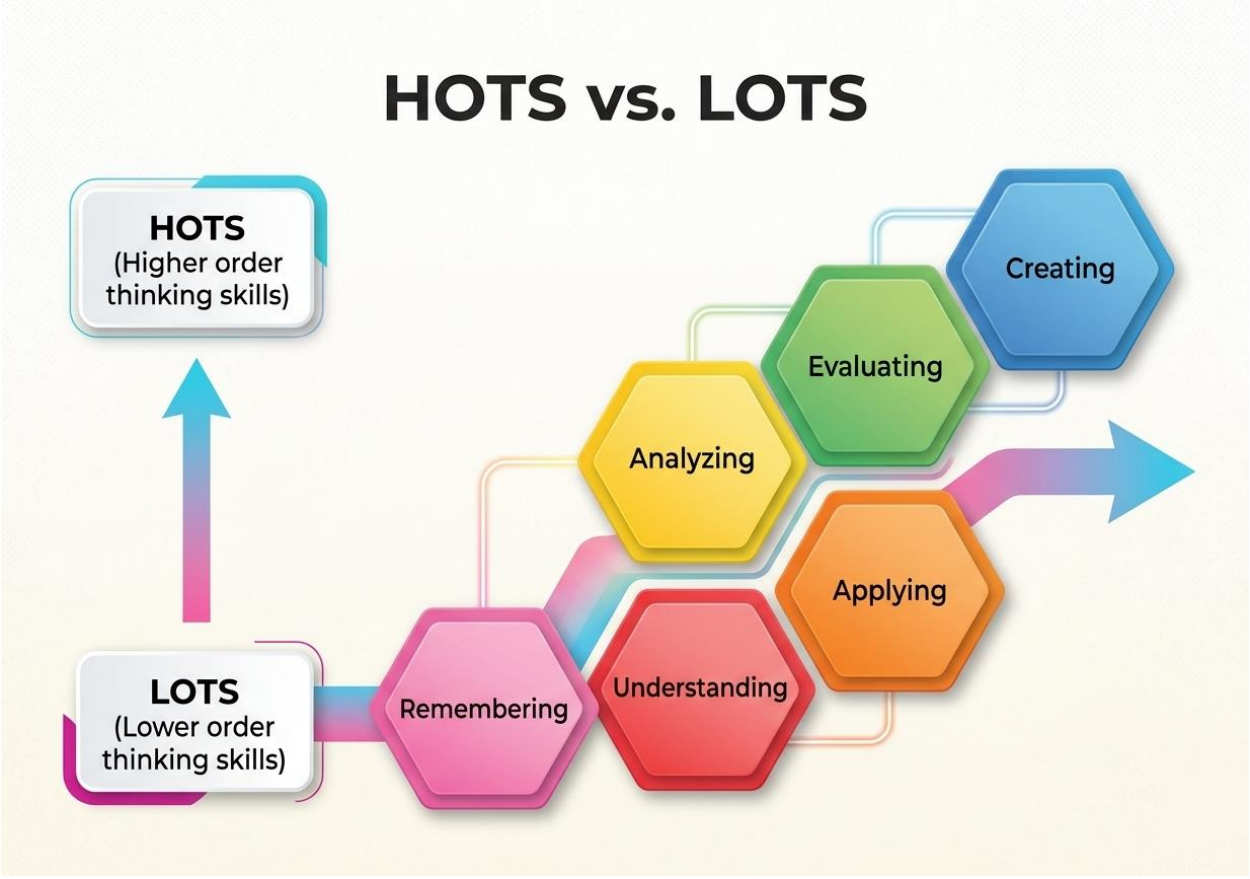
6. Assessment Architectures and Critical Thinking

The shift from rote memorization toward competency-based learning is most visible in the assessment sections of the textbooks. Both the Federal and Balochistan boards include standardized exercises at the end of each chapter, but their evaluative focus differs in terms of cognitive depth (Rehman et al., 2024).

6.1 Federal Board: Higher-Order Thinking Skills (HOTS)

The Federal Board Science textbook incorporates "Critical Thinking Review Questions" that go beyond simple recall. These questions require students to evaluate, analyze, and synthesize information. For example, in the chapter on "Mixtures," students are not just asked to define filtration; they are presented with a scenario where a student has accidentally mixed iron filings, salt, sand, and water and must determine the *best* sequence of steps to separate all components. This requires an understanding of the sequential application of magnetism, filtration, and evaporation (UNESCO, 2023).

Figure 1: Comparison of Higher Order Thinking Skills (HOTS) and Lower Order Thinking



Other critical thinking questions in the NBF text include:

- **Astronomy:** Asking students to identify which planet astronauts should study if they seek a day length similar to Earth (Mars), or why Jupiter has the most moons (gravity).
- **Physics/Forces:** A scenario where a cyclist moves uphill, downhill, and on flat roads, asking students to identify where gravity is acting (at all positions).
- **Thermal Science:** Asking whether a person feels uncomfortable on a winter night because "cold is getting in" or because "heat is escaping from the room," which tests the concept of heat transfer from high to low temperatures (Shah, 2019).

6.2 Balochistan Board: Content Mastery and Taxonomy

The Balochistan Textbook Board utilizes a more standardized and comprehensive exercise format designed to ensure content mastery. These exercises include:

- **Multiple Choice Questions (MCQs):** Standardized across all chapters to test core definitions and facts.
- **Matching Columns and Fill in the Blanks:** Used to reinforce the relationship between scientific terms and their functions, such as matching a part of the microscope with its specific role.
- **True/False Statements:** Challenging students to identify scientifically incorrect claims.
- **Descriptive/Long Questions:** Requiring students to explain processes like "Respiration in Plants" or to "Draw and label the basic structure of an animal cell" (Khan, 2024).

While the BTBB assessments are rigorous in their demand for detail, studies have noted that the alignment between these exercises and the intended Student Learning Outcomes (SLOs) can sometimes be irregular. For instance, if the SLO requires students to "discuss usual digestive sickness," the exercise must include specific questions on these disorders to be considered fully aligned a challenge that both provincial and federal boards are currently addressing under the SNC reforms (Ahmed & Hussain, 2023).

Table 5: Assessment Methodologies and Depth

Assessment Type	Federal Board (NBF) Usage	Balochistan Board (BTBB) Usage
MCQs	Used for conceptual check and quiz prep	Heavy emphasis for entrance exam (EST/JVT) prep
Short Answers	Focused on "How" and "Why"	Focused on "What" and "Define"
HOTS/Critical Thinking	Embedded in review questions and projects	Less frequent; focus on factual accuracy
Diagrammatic Work	Identification of energy forms/machines	High demand for drawing and labeling anatomy
Digital Assessment	Practice tests available at book level on Sabaq.pk	Self-study focused via offline physical exercises

7. Sociocultural Factors, Inclusivity, and Religious Integration

Science textbooks in Pakistan are not produced in a vacuum; they reflect the sociocultural values and political aspirations of the state. The Federal Board and Balochistan Board Grade 6 Science textbooks incorporate elements of religious integration and gender sensitivity, which are mandated by the National Curriculum (Naseer et al., 2016).

7.1 Religious Integration in Science

A unique aspect of Pakistani science textbooks is the inclusion of religious context, often starting chapters with Qur'anic verses that highlight the wonders of creation or the importance of seeking knowledge (Kakar, 2022). This is intended to "Islamize science" and provide a framework that reconciles scientific inquiry with the majority faith of the students. In the Balochistan Board, this is seen as an influential way to prove that Islam is a scientific religion, which can impact students' critical thinking by framing science within a "regime of truth". The Federal Board also maintains this balance, though its content is often described as "less controversial" and more globally aligned (Kanwal, 2022).

7.2 Gender Sensitivity and Inclusivity

Under the Single National Curriculum, there is a concerted effort to inculcate gender sensitivity in all textbooks. For the Grade 6 Science textbooks, this translates to illustrations that show both boys and girls actively exploring nature, performing experiments, and engaging with technology. The NBF "Curiosity" textbook, for example, depicts a mixed-gender representation on its cover to reduce gender disparity. Balochistan's educational sector plans also highlight the need for gender-responsive foundational learning materials to ensure that both male and female students in the province have equal opportunities to succeed in STEM fields (Nosheen et al., 2018).

7.3 Geographical and Socioeconomic Context

The Balochistan Textbook Board must cater to a population where many students face "financial constraints or geographical limitations". Consequently, their textbooks are designed to be self-sufficient learning tools that do not rely heavily on expensive laboratory equipment. The focus on "Technology in Everyday Life" in the NBF book while innovative requires access to specific materials (e.g., circuit components, earthen pots, milk for yogurt) that may be more readily available in urban federal districts than in the remote areas of Balochistan. This highlights a perennial challenge in implementing a "uniform" curriculum across vastly different socioeconomic landscapes (Rubab et al., 2021).

8. Implementation Challenges and the Path Forward

The transition to a unified Grade 6 Science curriculum in Pakistan faces several systemic hurdles. The success of the NBF and BTBB textbooks is ultimately dependent on the broader educational environment, including teacher training and resource availability (SED, 2020).

8.1 The Gap in Teacher Training

A critical finding in provincial audits is that textbooks, no matter how well-designed, cannot compensate for a lack of teacher training. In Balochistan, teachers have expressed disagreement with the difficulty level of some activities and a lack of proper training to facilitate inquiry-based learning. The Federal Board also faces challenges in "squeezing a nine-month syllabus into a five-month period" during accelerated learning programs, which requires teachers to have high pedagogical agility (Pattnaik et al., 2012).

8.2 SLOS Alignment and the "Teaching to the Test" Phenomenon

There is a growing concern that the alignment with standardized assessments like TIMSS might lead to a "teaching to the test" culture. While the SNC aims to improve learning outcomes, if the textbooks and assessments do not perfectly align with the Student Learning Outcomes (SLOs), the quality of education may suffer. For example, if a textbook omits questions on "digestive disorders" despite it being an SLO, students may never master that content (Muzaffar & Javaid, 2018).

8.3 Future Outlook: Digital and STEAM Education

The future of science education in Pakistan lies in the expansion of STEAM (Science, Technology, Engineering, Arts, and Mathematics) and the hybrid learning model. The Federal Board's early adoption of QR codes and online video lessons provides a blueprint for other provinces. Meanwhile, Balochistan's focus on extensive detail and foundational rigor ensures that students are prepared for the competitive MDCAT and entrance exams that require deep subject knowledge (Gentili, 2018).

Table 6: Comparative Overview of Strategic Approaches

Feature Comparison	Federal Board (NBF)	Balochistan Board (BTBB)
Pedagogical Focus	Inquiry, Application, Technology	Description, Detail, Taxonomy
Primary Strength	Blended learning and HOTS	Technical rigor and foundational depth
Visuals	Infographic-heavy with QR codes	Technical diagrams and machine models
Assessment Style	Critical thinking and scenario-based	Terminology matching and descriptive recall
Reform Alignment	Leader in SNC implementation	Strong foundational bridge to 2006 curriculum

Conclusion

The comparative analysis of the Federal Board and Balochistan Board Grade 6 Science textbooks highlights two distinct yet valuable approaches to science education in Pakistan. The Federal Board textbook reflects a modern educational philosophy centered on inquiry-based learning, conceptual understanding, digital integration, and the development of critical thinking and problem-solving skills. Its emphasis on STEAM education, real-life applications, and blended learning environments aligns closely with contemporary global educational trends and the objectives of the Single National Curriculum (SNC). Conversely, the Balochistan Textbook Board provides a more detailed and descriptive framework that prioritizes foundational scientific knowledge, technical precision, and comprehensive content coverage. Its strong focus on taxonomy, diagrammatic explanation, and detailed conceptual treatment supports students in building a solid academic base for advanced science education. The analysis further demonstrates that both textbooks attempt to align with national curricular goals while addressing regional educational realities and sociocultural considerations. However, implementation challenges such as insufficient teacher training, unequal access to technological resources, and inconsistencies in Student Learning Outcome (SLO) alignment continue to affect the effectiveness of science education across Pakistan. The study suggests that a balanced integration of both approaches combining the Federal Board's innovation and inquiry-driven pedagogy with the Balochistan Board's depth and rigor could significantly enhance science learning outcomes. Future reforms should focus on teacher capacity building, improved digital accessibility, curriculum standardization, and assessment practices that promote both conceptual understanding and analytical thinking. Such integrated efforts are essential for developing scientifically literate, creative, and critically aware students capable of meeting the educational and technological demands of the modern world.

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