A Conceptual Framework for Integrating Innovative Formative Assessment Strategies Aligned with NEP 2020 Goals

Jagriti Singha*, Rahul Ghosh**, and Alok Gardia***

Abstract

Traditional assessment practices have long been criticised for their emphasis on rote memorisation, high-stake examinations, and limited formative feedback, thereby constraining students' holistic development. The National Education Policy (NEP) 2020 envisions a paradigm shift towards competency-based assessment that promotes higher-order thinking, conceptual understanding, and real-world application. This study delineates key criteria for innovative formative assessment, emphasising student-centred, technology-enabled, and competency-based evaluation models. Drawing on constructivist and experiential learning theories, the paper integrates theoretical perspectives with assessment practices, advocating formative approaches such as performance-based assessment, peer and self-assessment, and digital assessment tools to enhance learners' critical thinking and adaptability. The study proposes a conceptual framework synthesising existing literature on innovative formative assessment strategies in language and science education. Additionally, it examines the role of PARAKH in standardising and transforming India's assessment ecosystem by ensuring equitable and competency-driven evaluation practices. By incorporating global best practices and technology-enhanced assessm ent models, this framework underscores a transition towards holistic, adaptive learning environments that prepare learners for the demands of the twenty-first-century workforce.

Keywords: National Education Policy (NEP) 2020, Innovative Formative Assessment, Language and Science Education, Twenty-first-century Skills

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Introduction

The National Education Policy (NEP) 2020 explicitly calls for a transition from summative assessments centred on rote memorisation to continuous, formative, and competency-based evaluation systems that foster higher-order cognitive skills such as analysis, creativity, and critical thinking (Government of India, 2020, para. 4.34). Assessment plays a pivotal role in monitoring student learning and informing pedagogical decision-making (Singh and Kaur, 2023). As Pathak and Maity (2024, p. 1) aptly observe, "assessing a student's performance is a two-way window," offering insights into both instructional effectiveness and individual learning trajectories.

NEP 2020 advocates a holistic and multidimensional assessment framework that integrates learning with evaluation and promotes conceptual understanding over content reproduction. To support this transformation, the policy mandates the establishment of the National Assessment Centre—PARAKH—to set benchmarks, standardise assessment practices, and enhance educational quality across school boards (Sujatha, 2024). PARAKH is expected to shift assessment culture from traditional written examinations towards self-assessment, peer assessment, parental feedback, and competency-based evaluation (Borah, 2022), thereby ensuring equity and consistency across diverse educational contexts.

In this context, the formative assessment assumes critical importance, as it provides timely feedback, enables instructional adjustment, and supports continuous learning (Singh and Kaur, 2023). Innovative formative assessment strategies encourage learners to apply classroom knowledge to real-life contexts, moving beyond memorisation towards skill development and conceptual clarity. Subject-specific formative approaches in language and science education further enhance learner engagement by aligning assessment with disciplinary practices.

This paper proposes a conceptual framework synthesising global research on innovative formative assessment practices in language and science education, aligned with the goals of NEP 2020. Grounded in constructivist and experiential learning theories, the framework seeks to guide educators in implementing learner-centred, equitable, and technology-enhanced assessment practices that promote lifelong learning.

Criteria for Innovative Assessment

Innovative assessment practices are characterised by their alignment with constructivist learning principles, active learner engagement, integration of assessment with instruction, and responsiveness to diverse learner needs. These approaches challenge traditional assessment paradigms by prioritising authenticity, inclusivity, and real-world

relevance over rote memorisation and high-stakes testing.

Student-centred and Constructivist Orientation

Innovative assessments foreground active learner participation, enabling students to construct knowledge through authentic and meaningful tasks. Unlike conventional examinations constrained by time, standardisation, and limited support, these approaches promote inquiry, collaboration, and problem-solving (McDowell, 2002). Project-based learning and portfolio assessment exemplify this orientation by engaging learners in real-world problem-solving, reflection, and knowledge construction (Kokotsaki *et al.*, 2016; Mahayukti *et al.*, 2018).

Authenticity and Real-World Relevance

Authentic assessment bridges the gap between academic learning and the professional practice by embedding real-world challenges within assessment tasks. Project-based assessment nurtures transferable skills, such as leadership, systems thinking, and critical reasoning, thereby enhancing learner employability (Nägele and Stalder, 2017; Holmes, 2012). Competency-based assessment further ensures that learners are able to apply conceptual understanding in practical and contextualised situations (Akhil Bhartiya Shiksha Samagam, 2023).

Continuous and Formative Feedback

In contrast to summative examinations, innovative assessment prioritises continuous evaluation and timely feedback. Continuous and Comprehensive Evaluation (CCE) facilitates ongoing monitoring of learner progress and supports personalised instructional interventions (Rao and Panapana, 2020). Tools such as quizzes, exit tickets, self-assessment, and peer feedback provide immediate insights into learning gaps while informing instructional decision-making (Salas-Morera *et al.*, 2012; Patricia and Deborah, 2012).

Collaborative and Peer-led Learning

Peer and self-assessment strategies foster collaborative learning, metacognitive awareness, and shared responsibility for learning. Peer assessment, when guided by transparent criteria and rubrics, these enhances learner engagement and critical judgement (Carlos *et al.*, 2014). Pedagogical approaches such as Socratic seminars and team-based learning, further promote dialogue, collective reasoning, and cooperative problem-solving (Castellanos-Reyes, 2021; Burgess *et al.*, 2020).

Technology-enhanced and Scalable Assessment

Digital technologies significantly enhance the efficiency, accuracy, and scalability of assessment practices. Learning Management Systems enable streamlined submission, grading, and feedback, while AI-enabled

tools support adaptive evaluation and personalised learning pathways (Gonzalez Calatayud *et al.*, 2021; Khatser and Khatser, 2022). Online quizzes, simulations, and e-portfolios offer multimodal opportunities for learners to demonstrate knowledge and skills (España-Delgado, 2023; Zhang and Tur, 2022).

Multidisciplinary and Holistic Evaluation

Innovative assessment adopts interdisciplinary approaches that encourage learners to integrate the knowledge across domains. The interdisciplinary projects promote adaptability, systems thinking, and complex problem-solving abilities (Berasategi *et al.*, 2020; Kim and Tan, 2013). Portfolio assessment supports holistic evaluation by documenting learners' reflective practices, decision-making processes, and professional growth over time (Haldane, 2014).

Inclusive and Equitable Assessment Practices

Equity is central to innovative assessment design. Flexible assessment options, co-created evaluation criteria, and inclusive task design ensure that learners from diverse linguistic, cultural, and ability backgrounds are able to demonstrate learning effectively (Tai *et al.*, 2021). Assessment for the social justice extends beyond procedural fairness to emphasise equitable learning outcomes and meaningful participation for all learners (Ajjawi *et al.*, 2022).

Assessment Strategies Grounded in Educational Theories

Constructivist learning theory underpins student-centred assessment by emphasising active engagement, social interaction, and scaffolding (Piaget, 1954; Vygotsky, 1978). The concept of the Zone of Proximal Development highlights the role of guided learning through peer collaboration, formative feedback, and instructional support (Shepard, 2000). Scaffolding enables learners to gradually assume ownership of performance-based tasks (Bruner, 1966).

Formative assessment models emphasise feedback loops that inform instructional adjustments and foster learner self-regulation (Black and Wiliam, 1998), aligning closely with NEP 2020's competency-based vision. In language education, interactive assessment strategies such as role-play, simulations, and digital tools, support authentic language acquisition (Krashen, 1985; Jonassen, 1991). In science education, inquiry-based frameworks such as the 5E model and Claim – Evidence – Reasoning (CER) promote conceptual understanding and scientific reasoning (Bybee, 2006; McNeill and Krajcik, 2008).

Self-regulated learning theory and growth mindset perspectives further position formative assessment as a catalyst for motivation, reflection, and lifelong learning (Schunk, 2012; Dweck, 2006). Technological frameworks incorporating AI-driven analytics and adaptive testing enhance personalisation while maintaining

the fairness, transparency, and scalability in assessment systems (McKay, 2013; Jollibekova, 2024).

Integrating Constructivist and Experiential Learning Theories into Innovative Formative Assessment of Language Education

Constructivist learning theory emphasises that learners actively construct knowledge through meaningful interactions with language, supported by social dialogue, scaffolding, and reflection (Vygotsky, 1978; Bruner, 1996). Complementing this perspective, experiential learning foregrounds learners' engagement with concrete, real-life tasks, encouraging cycles of reflection, conceptualisation, and the reapplication of linguistic knowledge (Kolb, 1984; Moon, 2004). Together, these theoretical foundations inform pedagogical strategies that foster learner engagement, deeper understanding, and authentic language use.

Instructional approaches, such as inquiry-based learning, collaborative group activities, and problem-solving tasks enable learners to negotiate meaning within social and

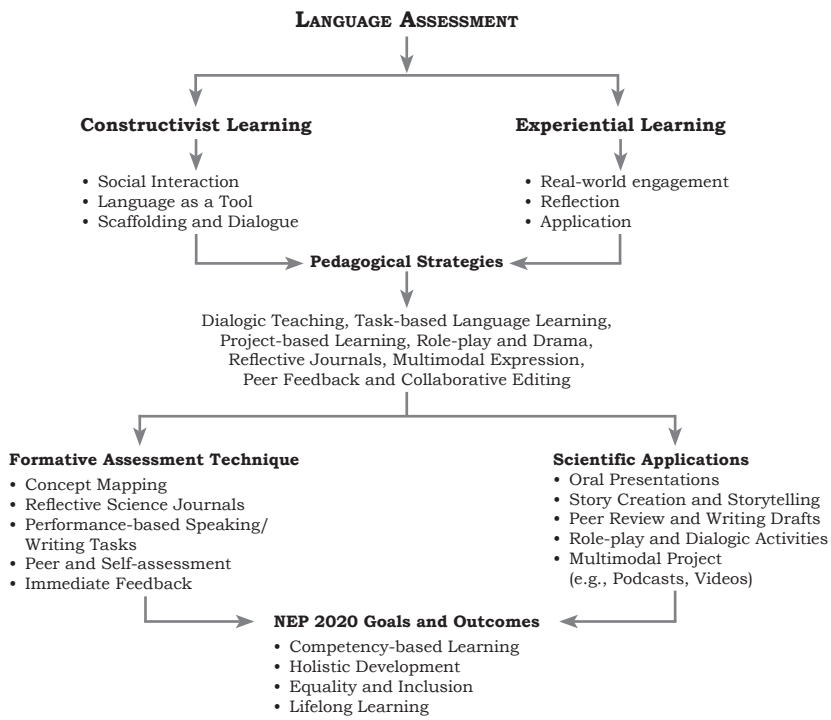

Fig. 1. A conceptual diagram depicting the constructivist and experiential approach to language learning and assessment

contextual frameworks (NCERT, 2023; Darling-Hammond *et al.*, 2017). Language learning thus becomes a participatory and exploratory process in which meaning is co-constructed rather than memorised (Nicol and Macfarlane-Dick, 2006). In alignment with this pedagogical orientation, innovative formative assessment strategies are seamlessly embedded within everyday classroom practices.

Formative assessment tools such as concept mapping support learners in visualising and connecting linguistic concepts (Gulikers *et al.*, 2004), while reflective journals enable students to document language use, challenges, and growth over time (Moon, 2004). Performance-based tasks, including contextualised speaking and writing activities, assess learners' ability to apply language meaningfully in authentic situations (Black and Wiliam, 1998). Peer and self-assessment, supported by immediate and descriptive feedback, further promote self-regulation, metacognitive awareness, and learner autonomy (Nicol *et al.*, 2006; Guskey, 2000).

These assessment practices directly inform classroom language applications. Learners engage in oral presentations, story creation and storytelling, peer-reviewed writing drafts, dialogic role-play, and multimodal communication projects (NCERT, 2023; Ministry of Education, 2020). Such authentic tasks mirror real-world communication demands and encourage purposeful, creative, and confident language use (Gulikers *et al.*, 2004).

This integrated assessment model strongly supports the realisation of NEP 2020 goals by promoting competency-based learning, grounded in authentic language use rather than rote memorisation (Ministry of Education, 2020). It fosters holistic development across cognitive, social, and emotional domains (Fullan, 2007), while ensuring equity and inclusion through flexible and responsive assessment practices that accommodate diverse learner needs (UNESCO, 2015; PRATHAM, 2020). By encouraging reflection and learner autonomy, the framework further nurtures lifelong learning skills, preparing students to engage with the language critically and confidently beyond the classroom (Nicol and Macfarlane-Dick, 2006; Moon, 2004).

Integrating Constructivist and Experiential Learning Theories into Innovative Formative Assessment of Science Education

In the science education, constructivist theory underscores that the learners actively build scientific understanding through inquiry, exploration, and reflection (Windschitl, 2002), while experiential learning highlights the importance of engaging learners in concrete tasks involving observation, experimentation, and application (Kolb and Kolb, 2017). Together, these perspectives inform pedagogical approaches that prioritise inquiry-based learning, collaborative investigation, and real-world problem-solving.

Learners are encouraged to question phenomena, design investigations, analyse evidence, and communicate findings in ways that reflect authentic scientific practices (Hmelo-Silver *et al.*, 2007). Such learner-centred approaches promote deeper conceptual understanding and move beyond surface-level content coverage. Within this pedagogical framework, innovative formative assessment strategies are embedded to support continuous learning and reflective thinking.

Concept mapping enables learners to establish meaningful connections between scientific concepts and processes (Novak and Cañas, 2008). Reflective science journals foster metacognitive awareness by encouraging students to articulate observations, reasoning, and learning progression (Boud and Molloy, 2013). Performance-based assessments—including the hands-on experiments, model construction, and oral scientific explanations—evaluate not only content knowledge but also application, reasoning,

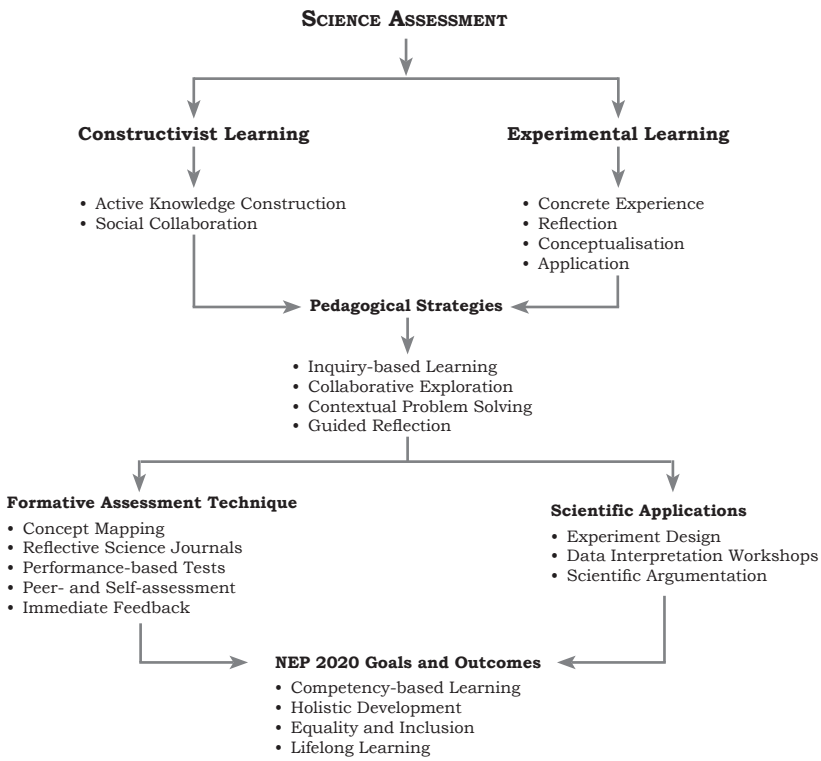

Fig. 2. A conceptual diagram depicting the constructivist and experiential approach to science education and assessment

and communication skills (Gulikers *et al.*, 2004). Peer and self-assessment strategies further enhance learner autonomy and collaborative engagement, while immediate feedback supports real-time learning and conceptual refinement (Shute, 2008).

These formative assessment practices are directly applied to core scientific activities such as experimental design, data interpretation, and scientific argumentation. By engaging in authentic scientific tasks, learners develop scientific literacy, critical thinking, and problem-solving capabilities, functioning as young scientists within classroom learning communities (Osborne, 2014). At a broader level, this integrated assessment approach supports holistic development, promotes equity and inclusion by offering multiple pathways for demonstrating understanding, and cultivates lifelong learning by equipping learners with transferable scientific reasoning skills and reflective habits (NCERT, 2023; PARAKH, 2023).

Innovative Formative Language Assessment Strategies

Performance-based Evaluations

Performance-based assessments engage learners in authentic, real-world language tasks such as business negotiations, medical consultations, debates, and professional presentations. These assessments foreground contextual language use and strategic communication, thereby strengthening practical language proficiency and communicative competence (Utami *et al.*, 2021; Jollibekova, 2024).

For instance, literature circles require students to assume specific roles—such as summariser, discussion director, connector, or vocabulary enricher—and present analyses of selected chapters from texts such as "The Giver or To Kill a Mockingbird". This approach promotes interpretative skills, collaborative learning, and critical engagement with literary texts.

Simulation Exercises and Role-playing

Simulation-based activities immerse learners in realistic communicative scenarios, including mock interviews, customer service interactions, and institutional encounters. These tasks foster fluency, adaptability, and pragmatic language use while encouraging collaborative learning and problem-solving (Nykyporets *et al.*, 2023; Huang *et al.*, 2024).

For example, in an ESL classroom, students may role-play an immigration officer and a traveller, requiring them to negotiate meaning, respond spontaneously, and apply functional language skills within contextually authentic situations.

Continuous Formative Assessment

Continuous formative assessment strategies—including digital portfolios,

reflective journals, frequent low-stakes quizzes, and peer feedback—enable learners to monitor progress and refine learning strategies. These tools support personalised learning trajectories and sustained improvement across reading, writing, speaking, and listening skills (Soomro *et al.*, 2023; Fitria, 2020).

A practical illustration is "My English Growth Journal," a digital portfolio maintained using platforms, such as Google Docs, Padlet, Seesaw, or OneNote, through which students regularly upload language tasks, reflect on progress, and receive formative feedback.

Technology and AI Integration

Technology-enhanced assessments, including AI-driven tools, provide real-time feedback, adaptive learning pathways, and automated scoring. Applications such as classroom chatbots, computer-assisted language testing (CALT), speech recognition software, and virtual simulations enhance accessibility, efficiency, and accuracy, particularly in blended and remote learning environments (Sihag, 2023; Omonova, 2024).

Multimodal Assessment Techniques

Multimodal assessments integrate videos, podcasts, digital storytelling, and interactive applications to accommodate diverse learning styles. By combining visual, auditory, and kinaesthetic modes, these strategies enhance the engagement, comprehension, and retention while bridging theoretical learning with real-world application (Sawalmeh and Dey, 2023).

For example, students may create short video narratives (1–3 minutes) incorporating spoken narration, visuals, subtitles, and sound effects to demonstrate language proficiency creatively.

Innovative Formative Science Assessment Strategies

Classroom Response Systems (CRS)

CRS enable real-time formative assessment through interactive polling and quizzes, allowing teachers to identify misconceptions and adjust instruction immediately. These systems promote engagement, peer learning, and critical thinking and can be integrated with virtual laboratories and gamified learning environments (Beatty and Gerace, 2009; Henderson and Farkas, 2020).

For instance, during a biology lesson on cell structure, CRS responses may reveal confusion between mitochondrial and chloroplast functions, prompting timely clarification.

Plickers

Plickers offer a low-tech, equitable assessment solution using paper-coded response cards, enabling instant feedback without requiring student-owned digital devices. This approach supports concept checks, prior knowledge assessment, and inclusive participation (Howell *et al.*, 2017; Shana and Baki, 2020).

In a physics classroom, students may respond to questions on Newton's laws by holding up coded cards, allowing teachers to quickly identify misconceptions.

Sticky Bars

Sticky Bars are visual formative assessment tools in which students place sticky notes on a graph to represent their understanding. This strategy promotes discussion and provides immediate insights into student thinking (Keeley, 2008).

For example, following a lesson on Earth's layers, students indicate which layer they believe is the hottest by placing their responses on a bar chart.

Triangle of Power

The Triangle of Power framework connects concepts, skills, and real-world applications, thereby reinforcing scientific reasoning and integrated understanding (Chonowski, 2017).

In chemistry, students may explore acids and bases (concept), conduct neutralisation reactions (skill), and analyse the role of antacids in everyday life (application).

Before-During-After (BDA) Strategy

The BDA framework structures learning by activating prior knowledge, engaging learners in hands-on inquiry, and encouraging reflection on outcomes. This approach deepens conceptual understanding and supports inquiry-based learning (K20 LEARN, n.d.).

For instance, in a lesson on photosynthesis, students brainstorm existing knowledge, conduct experiments on oxygen release, and synthesise findings through reflection.

Claim–Evidence–Reasoning (CER)

The CER framework strengthens scientific literacy by guiding students to formulate claims, support them with evidence, and justify reasoning (McNeill and Krajcik, 2008).

For example, when analysing soil water retention, students articulate claims supported by quantitative data and scientific explanations.

Exit Tickets

Exit tickets provide brief reflective opportunities for students to summarise learning, pose questions, and connect concepts to real-life contexts. This strategy supports learner self-reflection and instructional adjustment (K20 LEARN, n.d.).

Aligning Assessment Strategies with NEP 2020 Goals

The National Education Policy (NEP) 2020 represents a paradigm shift from rote-based, high-stakes examinations towards competency-based, holistic, and formative assessment systems. It reconceptualises assessment as an integral component of learning, emphasising continuous feedback, conceptual understanding, real-world application, and learner agency.

Transition to Competency-based Assessment

NEP 2020 advocates assessment models that prioritise higher-order thinking, creativity, and problem-solving over memorisation (Singh and Kaur, 2023). Formative strategies, such as peer assessment, simulations, CRS, and exit tickets support continuous monitoring of learning and timely pedagogical interventions (Black and Wiliam, 1998; Henderson and Farkas, 2020).

Constructivist and Experiential Approaches

Grounded in constructivist and experiential learning theories (Piaget, 1954; Vygotsky, 1978; Kolb, 1984), NEP 2020 promotes inquiry-based, interactive, and experiential learning. Assessment tools such as CER, role-play, multimodal tasks, and hands-on experiments facilitate knowledge construction and authentic learning experiences.

Role of PARAKH

PARAKH plays a central role in standardising competency-based assessments across school boards, ensuring equity, conceptual clarity, and holistic evaluation (Borah, 2022). Its initiatives, including holistic progress cards and large-scale achievement surveys, align closely with the formative and skill-based assessment practices envisioned under NEP 2020 (NCERT, 2023).

Technology and AI Integration

NEP 2020 highlights the transformative potential of technology-enabled assessments, including AI-driven feedback, adaptive testing, digital portfolios, and performance analytics. These tools enhance scalability, inclusivity, and personalisation while maintaining assessment integrity (McKay, 2013; Sihag, 2023).

Holistic and Inclusive Evaluation

The policy emphasises multimodal, flexible, and inclusive assessment practices that recognise cognitive, social, and emotional development. Reflective journals, digital portfolios, and 360-degree progress cards promote self-awareness, equity, and lifelong learning (Sujatha, 2024).

Feasibility Considerations for Implementation

Teacher Capacity and Professional Development

Sustained professional development is essential for enabling teachers to translate constructivist and experiential pedagogies into effective formative assessment practices. Without continuous mentoring and reflective opportunities, educators may revert to traditional assessment modes despite endorsing learner-centred approaches (Guskey, 2000). Collaborative professional learning communities, particularly at cluster or district levels, support the institutionalisation of innovative practices (Darling-Hammond *et al.*, 2017; Fullan, 2007).

Policy Alignment and Curricular Flexibility

NEP 2020 and the National Curriculum Framework (NCERT, 2023) provide strong policy mandates for embedding formative assessment within subject curricula. However, where content-heavy syllabi persist, schools may need to reinterpret curricular standards or negotiate with examination boards. PARAKH's standardised rubrics and exemplars offer crucial support for integrating formative assessment without compromising board requirements (Sujatha, 2024).

Resource Availability and Low-cost Alternatives

Resource constraints—particularly in rural and underfunded schools—pose significant challenges to the implementation of hands-on experiments, digital platforms, and laboratory-based formative assessments. Limited access to reliable electricity, internet connectivity, and well-equipped laboratories continues to affect many regions (UNESCO, 2015), with rural schools especially lacking the infrastructure required for experimental science learning or digital portfolio-based assessments (PRATHAM, 2020).

Despite these constraints, several low-cost yet high-impact formative assessment strategies can be effectively implemented with minimal resources. Paper-based concept mapping, structured group discussions, oral presentations, peer questioning, and teacher observational checklists offer viable alternatives that support conceptual understanding and skill development without dependence on advanced technology. Over time, phased implementation supported by government initiatives, CSR funding, or public–private partnerships may enable schools to gradually acquire basic science apparatus and affordable digital devices for documentation, feedback, and assessment tracking.

Student Engagement and Inclusivity

Formative assessment practices—particularly self- and peer-assessment accompanied by descriptive, actionable feedback—have been shown to enhance learner motivation and foster self-regulated learning (Nicol and Macfarlane-Dick, 2006). By offering differentiated assessment modalities, such as oral or audio-based responses for language learners and simplified observation tools for practical science activities, teachers can better accommodate diverse learning needs, abilities, and linguistic backgrounds.

Such inclusive assessment practices promote learner agency, confidence, and participation, aligning closely with the principles of equity and accessibility emphasised in both constructivist and experiential learning frameworks. They also ensure that assessment serves as a tool for learning rather

than exclusion, particularly for first-generation learners and students from marginalised contexts.

Monitoring and Continuous Improvement

The sustainability of formative assessment reforms depends on the systematic monitoring mechanisms and a commitment to continuous improvement. Regular data review, collaborative teacher reflection forums, and iterative feedback loops allow schools to evaluate the effectiveness of assessment practices and address emerging challenges in implementation (Fullan, 2007). Drawing on Guskey's (2000) model of professional development evaluation, schools can assess the impact of formative assessment reforms across multiple dimensions, including teacher learning, instructional change, organisational support, and student learning outcomes.

PARAKH's emphasis on periodic audits, exemplar-based benchmarking, and portfolio reviews further strengthens alignment with NEP 2020 goals. Institutional structures such as monthly teacher collaboration meetings and bi-annual student progress reviews help to embed formative assessment within a responsive, self-correcting, and evidence-informed system.

Conclusion

The National Education Policy (NEP) 2020 represents a transformative shift in India's educational assessment framework, advocating a move away from rote-based, summative evaluations towards competency-driven, holistic, and formative assessment practices. This paper has highlighted the significance of innovative formative assessment strategies in language and science education, emphasising their role in fostering critical thinking, conceptual understanding, and the meaningful application of knowledge in real-world contexts.

The integration of constructivist and experiential learning principles—supported by technology-enabled, personalised assessment approaches—aligns closely with the NEP 2020's vision of learner-centred and skill-oriented education for the twenty-first-century. The establishment of PARAKH plays a crucial role in standardising and ensuring equity in assessment practices across school boards, thereby strengthening the nationwide implementation of competency-based evaluations. The incorporation of AI-driven tools, adaptive learning technologies, and multimodal assessment strategies further enhances the inclusivity, scalability, and responsiveness of the assessment ecosystem.

By adopting performance-based evaluations, peer- and self-assessment practices, and digital and low-tech formative tools, educators can bridge learning gaps, enhance student engagement, and foster meaningful, lifelong learning experiences. Ultimately, the transition towards holistic, technology-integrated, and

competency-based assessment not only improves educational outcomes but also equips learners with higher-order thinking skills, problem-solving abilities, and adaptability—capabilities essential for navigating the demands of an increasingly complex global knowledge economy. As India progresses towards the full realisation of NEP 2020, these reformed assessment practices will be instrumental in shaping an inclusive, innovative, and future-ready education system.

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