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Innovative Pedagogies for Developing Scientific Temper and Critical Inquiry among School Students in the Light of NEP 2020

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ABSTRACT

The present study examines the potential of innovative pedagogies for developing scientific temper and critical inquiry among school students in the light of the National Education Policy (NEP) 2020. Adopting a qualitative, descriptive, document-based approach, the study draws exclusively on secondary sources, including peer-reviewed journal articles, books, reports, and policy documents. The literature was analysed thematically to understand how inquiry-based, experiential, project-based, problem-based, collaborative, interdisciplinary, and technology-supported pedagogies contribute to students' questioning, reasoning, investigation, evidence evaluation, and problem-solving abilities. The findings suggest that innovative pedagogies can make science learning more active, meaningful, and learner-centred while creating opportunities for scientific thinking and evidence-based decision-making. However, effective implementation depends on teacher preparedness, adequate resources, curriculum flexibility, appropriate assessment practices, and equitable access to technology. The study concludes that scientific temper and critical inquiry should be integrated into everyday science learning in accordance with the pedagogical vision of NEP 2020.

Keywords: Innovative Pedagogy; Scientific Temper; Critical Inquiry; Science Education; NEP 2020

INTRODUCTION

In today's educational system, science instruction is supposed to be more than just imparting information and formulas. It should support students' growth in logical thinking, curiosity, questioning techniques, and the capacity to weigh the evidence before adopting a concept. Therefore, having a scientific temper is a crucial educational goal since it motivates students to address both academic and everyday issues with impartiality, reason, and a desire to learn. The National Education Policy (NEP) 2020 highlights scientific temper, critical thinking, experience-based learning, and inquiry-based education as crucial elements of holistic development in the Indian educational system. According to Singhal and Wadhwa (2022), the goal of science education under NEP 2020 is strongly linked to developing scientific literacy and empowering students to make knowledgeable judgements about science, technology, and society.

Conventional methods that primarily rely on explanation, memorisation, and textbook-based instruction may give students conceptual understanding but may not give them many chances to ask questions, conduct research, try new things, and apply what they have learned in novel contexts. Inquiry-based learning, experiential learning, problem-based learning, group activities, and learning using technology are examples of innovative pedagogies that can produce more dynamic learning environments where students take part in the process of creating knowledge. According to Medh (2020), well-planned ICT use in science classrooms can help students develop higher-order thinking skills, a scientific perspective, and critical thinking in addition to moving beyond rote learning.

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NEP 2020 lays the groundwork for such a pedagogical transition by supporting learning experiences that develop questioning, investigation, creativity, problem-solving, and practical application of knowledge. However, how these goals are implemented into regular classroom procedures has a significant impact on their efficacy. Teachers must design learning environments that inspire students to ask questions, look at supporting data, debate competing theories, carry out research, and consider their conclusions. Therefore, innovative pedagogy is a move toward more active, inquiry-based, and focused on students in classroom experiences rather than just introducing new teaching methods or digital tools.

In light of this, the present research aims to investigate the educational value of creative pedagogical approaches in encouraging students' critical thinking and scientific temper. The study is especially pertinent to the implementation of NEP 2020 since it is crucial to prepare students to respond meaningfully to academic, social, and real-life difficulties by developing in them the ability to question, reason, explore, and make evidence-based decisions.

Conceptual Framework of the Study

The present study's conceptual framework is predicated on the idea that innovative pedagogies, especially when they are in line with learner-centred and experiential vision of NEP 2020, can produce educational experiences that develop students' scientific temper and critical inquiry. Scientific learning is more significant when students have the opportunity to observe, question, research, examine evidence, discuss abstract concepts, and develop explanations rather than simply receiving information.

Research on inquiry-based science education lends credence to the concept. According to Kang (2022), inquiry-based learning promotes higher-order thinking and science literacy by giving students a more active role and chances to participate in procedures akin to real scientific activity. In the same way, Eymur and Çetin (2024), discovered that meaningful scientific practices using an argument-based inquiry approach can help students gain scientific literacy. The significance of inquiry-centric classroom methods in science education is further supported by research by Gómez and Suárez (2020), which similarly looked at the relationship between scientific achievement, critical thinking, and inquiry-based teaching.

Components of the Conceptual Framework

The framework has three interrelated components:

Innovative Pedagogical Practices

Innovative pedagogy is considered the independent variable in this study. It consists of:

- Experiential learning
- Inquiry-based learning
- Project-based learning
- Problem-based learning
- Collaborative learning
- Blended and technology-assisted learning
- Gamification and activity-based learning
- Interdisciplinary learning

These methods give students the chance to learn through experience, research, collaborative effort, experimentation, and problem-solving. Research on science education shows that inquiry-based methods can support higher-order thinking and scientific literacy.

Scientific Temper and Critical Inquiry

The dependent variables of the study are scientific temper and critical inquiry. The term "scientific temper" describes students' propensity to address issues and circumstances using logic, evidence, objectivity, reason, and curiosity. Questioning presumptions, recognising issues, gathering and assessing evidence, analysing data, taking into account competing theories, and drawing logical conclusions are all components of critical inquiry.

Research has indicated that inquiry-based learning might improve critical thinking and problem-solving abilities. Sutiani *et al.* (2021), observed improvement in students' critical thinking following the introduction of an inquiry learning model integrated with science literacy.

NEP 2020 as the Guiding Context

NEP 2020 provides a contextual and supporting framework for the investigation. The policy basis for investigating innovative pedagogies in school education is provided by its emphasis on experiential learning, critical thinking, creativity, problem-solving, scientific temper, integrated learning, and student-centered education.

Conceptual Relationship

The proposed relationship can be represented as:

Innovative Pedagogical Practices

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Active, Experiential and Inquiry-Oriented Learning

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Questioning + Investigation + Evidence Analysis + Discussion + Problem Solving

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Development of Scientific Temper and Critical Inquiry

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Rational Thinking + Critical Thinking + Evidence-Based Decision Making

The comprehensive educational framework and guidance for this process are provided by NEP 2020.

Therefore, the framework suggests that innovative pedagogies might provide students more opportunities to participate in scientific inquiry when they are intentionally applied in line with the objectives of NEP 2020. It is anticipated that such involvement will promote the growth of scientific temper and critical inquiry, empowering students to approach academic and real-world issues with increased curiosity, reasoning, scientifically supported judgement, and problem-solving skills.

Research-Based Support for the Framework

Empirical data demonstrating the impact of inquiry-oriented pedagogies on scientific literacy and critical thinking lends special support to the theoretical framework. In their study of Grade 8 students, Eymur and Çetin (2024) discovered that students who engaged in argument-based inquiry outperformed those who engaged in structured inquiry in terms of scientific literacy. Similarly, students' critical thinking abilities were enhanced by inquiry learning combined with science literacy, according to research published in the International Journal of Instruction. These results offer an empirical foundation for connecting the development of the cognitive temperaments and abilities essential to scientific temper and critical inquiry with creative, inquiry-oriented instruction.

Review of Related Literature

Particularly in light of NEP 2020, the evaluation of related literature emphasises the growing significance of creative pedagogies in encouraging students' scientific temper, critical thinking abilities, and inquiry-based learning. Learner-centred, immersive, and technology-supported techniques that go beyond conventional teaching methods are highlighted in the study. In addition to acknowledging the critical role of teachers, curriculum design, and efficient use of technology, they emphasise the necessity of classroom activities that encourage curiosity, active involvement, and problem-solving. However, the literature also highlights issues including digital inequality and teacher readiness. The following studies offers a solid basis for comprehending how innovative pedagogies might improve critical thinking and scientific temper in the classroom.

Devi (2022) investigated the relevance of educational innovations for optimal learning in light of NEP 2020. Innovative teaching methods can inspire pupils to think creatively, investigate novel concepts, and acquire efficient problem-solving techniques, according to the study. It also emphasised how important it is for educators to use a variety of teaching techniques and establish classroom settings that encourage experimentation and creativity. The study came to the conclusion that consistent pedagogical innovation can raise educational standards by encouraging students' critical thinking, imaginative thinking, and meaningful learning.

Gupta and Prasad (2023) looked into how an innovative instructional technique affected secondary-level students' scientific achievement. Blended learning, gamification, computational thinking, hands-on learning, and experiential learning were the main components of the intervention used in the study, which involved 54 students in Class X. They employed a teacher-made achievement exam in a quasi-experimental design with an experimental group and control group, and the data was analysed using the t-test and ANCOVA. The results showed that learners who were taught using innovative pedagogy outperformed those who were taught using traditional approaches in science. Low-achieving students also showed a notable improvement. The study also showed that innovative pedagogy enhances academic accomplishment in science by encouraging active engagement, interaction, enjoyable learning, and greater conceptual comprehension.

Poonam and Ravish (2023) investigated the function of scientific education in NEP 2020, focusing on teacher growth and new teaching methods. The study emphasised the value of ongoing training, workshops, and professional development for enhancing instructors' subject-matter expertise and pedagogical abilities. It also highlighted how science education may be made more interesting and significant by utilising cutting-edge techniques and technology. They also highlighted that early exposure to scientific inquiry and project-based learning might inspire kids to think critically, conduct experiments, analyse data, and ask questions. According to the study, NEP 2020 offers a solid basis for enhancing scientific education through better teacher preparation, creativity, and learning

that is focused on research.

Karmakar and Chattopadhyay (2024) investigated the function of teachers in promoting a scientific temperament in the framework of NEP 2020. The study emphasised scientific temper as a mindset grounded in rational thought, logical reasoning, and evidence-based decision-making in everyday activities. They stressed that developing a scientific mindset in students is crucial for both personal development and the advancement of society and the country as a whole. The National Curriculum Framework and NEP 2020 guidelines were examined in the study, with a focus on the incorporation of scientific temper into school instruction and the implementation of specific programs and activities to support it. Additionally, it noted a number of barriers and limitations in the educational system that could impede the successful development of scientific temper. The study emphasises how important it is for teachers and educational organisations to support students' development of logical, rational, and scientifically supported thinking.

Hissaria and Grover (2026) investigated the importance of experiential and integrative learning in building scientific temper and problem-solving abilities via the lens of NEP 2020. The study emphasised the value of using experiential learning, experiments, inquiry-based projects, and interdisciplinary learning to link academic knowledge with real-world experiences. They highlighted that these methods can help students develop their critical thinking, creativity, logical reasoning, and solid evidence-based decision-making skills. According to the study, incorporating innovative pedagogies and technology into curricula and classroom procedures can promote comprehensive and future-focused learning. All things considered, the study offers NEP 2020 as a framework for developing autonomous, competent, and scientifically minded problem-solvers ready for dealing with real-world difficulties.

Yerunkar *et al.* (2026) examined the application of innovative pedagogies at various educational levels, from early childhood to higher education, with a focus on the consequences for education and health. Gamification, learning through play, flipped educational environments, blended and hybrid learning, and AI-supported adaptive technologies were all included in the review. The results showed that while innovative pedagogies can improve student engagement, personalisation, and skill development, their successful application is frequently hampered by issues related to curriculum, digital disparities, inadequate preparation for teachers, exclusion of underprivileged students, and anxieties about student data and privacy. Potential issues like screen fatigue, overthinking, digital exhaustion, psychological stress, and feeling isolated from society were also mentioned by the authors. The study emphasised the importance of balancing technological innovation with human-centered teaching approaches and health-conscious curriculum design to provide inclusive, sustainable, and significant learning experiences.

Critical Appraisal and Research Gap

Critical Appraisal

Innovative pedagogies have a great deal of promise to make science education more engaging, meaningful, and inquiry-based, according to the reviewed literature. In order to improve creativity, critical thinking, problem-solving, and basic scientific knowledge, the studies constantly emphasise the need of experiential, inquiry-based, project-based, interactive, multidisciplinary, and technology-supported approaches. In this regard, Gupta and Prasad (2023) found that using innovative educational approaches enhanced science achievement, even among low-achieving pupils. In the same way, study by Karmakar and Chattopadhyay (2024) and Hissaria and Grover (2026) highlights the significance of logical reasoning, scientific temper, experiential learning, and evidence-based thinking in the context of NEP 2020.

However, some limitations are also revealed by the examined investigations. The specific development of scientific temper and critical inquiry among school children receives somewhat less attention than innovative pedagogy in regard to academic achievement, general learning outcomes, or wide educational revolution. Additionally, even if technology-supported methods present new learning opportunities, their efficacy may rely on teacher readiness, curriculum alignment, fair access, and suitable classroom implementation. These systemic issues were specifically highlighted by Yerunkar *et al.* (2026), who also emphasised the necessity of implementing innovative pedagogies in a human-centered and sustainable manner.

Research Gap

The analysis finds a significant need for research that especially investigates the relationship between innovative pedagogies, scientific temper, and critical

inquiry among schoolchildren within the context of NEP 2020. Although present research offers important conceptual and empirical evidence for innovative learning, these three dimensions are not adequately integrated into a unified study topic. There is also a need to investigate if innovative methods of instruction may help students progress beyond greater academic achievement to deeper inquiry, logical reasoning, empirically supported judgement, exploration, and independent problem solving.

As a result, this study seeks to fill this gap by concentrating on the potential of innovative teaching methods to develop a scientific temper and critical inquiry in school pupils, as well as understanding these pedagogical practices in relation to NEP 2020's educational objectives. Thus, the study aims to provide information that could assist teachers and educational establishments in creating learning environments that are more learner-centred, inquiry-based, and encouraging of scientific thinking.

Objectives of the Study

The present qualitative study aims to:

1. Explore the use of innovative pedagogical practices in science classrooms to develop scientific temper and critical inquiry.
2. Analyse teachers' perceptions of inquiry-based, experiential, collaborative, project-based, and technology-supported learning in enhancing students' reasoning and evidence-based thinking.
3. Understand the opportunities and challenges in implementing innovative pedagogies aligned with NEP 2020 for developing scientific temper and critical inquiry.

Research Questions

The study seeks to answer the following research questions:

1. How innovative pedagogical practices are used in school science classrooms to develop students' scientific temper and critical inquiry?
2. How do teachers perceive the contribution of innovative pedagogies to students' questioning, reasoning, investigation, and evidence-based decision-making?
3. What opportunities and challenges do teachers experience while implementing innovative pedagogies in science education in alignment with NEP 2020?

METHODOLOGY

Research Approach and Design

The present study adopted a qualitative research approach to examine the role of innovative pedagogical practices in developing scientific temper and critical inquiry among school students in the light of NEP 2020. A qualitative approach was considered appropriate because the study seeks to interpret and synthesise ideas, perspectives, findings, and recommendations presented in existing scholarly literature and policy documents rather than measure the effectiveness of a particular intervention through numerical data.

The study employed a descriptive qualitative and document-based research design. The design enabled the researcher to systematically examine and interpret secondary sources related to innovative pedagogies, science education, scientific temper, critical inquiry, experiential learning, inquiry-based learning, project-based learning, problem-based learning, collaborative learning, technology-supported learning, and the pedagogical vision of NEP 2020. Qualitative research design provides a framework for examining educational phenomena through systematic interpretation of textual and documentary evidence (Creswell and Poth, 2018)

The study therefore does not involve direct interaction with students or teachers. Instead, it draws upon existing scholarly and documentary evidence to develop a comprehensive understanding of how innovative pedagogical approaches can contribute to scientific temper and critical inquiry within the educational framework of NEP 2020.

Sources of Data

The study was based exclusively on secondary sources of data. No primary data were collected through interviews, questionnaires, observations, experiments, or surveys. Secondary sources were selected because they provide established theoretical perspectives, empirical findings, policy directions, and documented evidence relevant to the research problem.

The major sources of secondary data included:

- Peer-reviewed journal articles related to innovative pedagogy, science education, scientific temper, critical thinking, inquiry-based learning, experiential learning, project-based learning, problem-based learning, collaborative learning, and technology-supported education.

- Books and scholarly books dealing with educational theory, constructivist pedagogy, science education, critical thinking, inquiry, and innovative teaching-learning practices.
- Government and institutional reports, particularly documents concerning school education, science education, curriculum reform, teacher education, and educational innovation.
- NEP 2020 and other relevant policy and curricular documents issued by the Government of India and educational institutions.
- Relevant review studies, research reports, and credible academic publications that provide evidence concerning the relationship between innovative pedagogy, scientific thinking, inquiry, and critical reasoning.

The official NEP 2020 document was treated as an important policy source because it provides the broader curricular and pedagogical framework within which the present study examines innovative science education. The policy emphasises curricular and pedagogical transformation and seeks to promote more holistic, learner-centred, and competency-oriented education.

Selection of Secondary Sources

The secondary literature was selected purposively according to its relevance to the objectives and research questions of the study. Priority was given to sources that directly addressed one or more of the following areas:

1. Innovative pedagogical practices in school education;
2. Innovative approaches to science teaching and learning;
3. Inquiry-based and experiential learning;
4. Development of scientific temper and scientific reasoning;
5. Critical thinking and critical inquiry among learners;
6. Project-based, problem-based, collaborative, and activity-based learning;
7. Technology-supported and blended pedagogical practices;
8. NEP 2020 and its curricular and pedagogical recommendations; and
9. Challenges and possibilities associated with implementing innovative pedagogy in school science education.

Greater emphasis was placed on peer-reviewed and academically credible sources. Relevant policy documents, government reports, and authoritative educational publications were also included because of their direct relevance to the policy dimension of the study.

Sources that were unrelated to the research questions, lacked sufficient academic credibility, or did not contribute substantially to understanding innovative science pedagogy, scientific temper, critical inquiry, or NEP 2020 were excluded from the analysis.

Data Collection Procedure

As the study relied exclusively on secondary data, the data collection process involved a systematic search, selection, organisation, and review of relevant documentary sources.

The researcher first identified the major concepts and themes associated with the research title and objectives. These included innovative pedagogy, scientific temper, critical inquiry, science education, inquiry-based learning, experiential learning, project-based learning, problem-based learning, collaborative learning, technology-supported learning, and NEP 2020.

Relevant journal articles, books, reports, policy documents, and other scholarly sources were subsequently identified through academic databases, scholarly search platforms, libraries, government publications, and institutional repositories. The selected sources were carefully reviewed for their relevance to the research questions.

Information relevant to the study was extracted and organised under broad thematic categories. Particular attention was given to the pedagogical approaches discussed in the literature, their educational purposes, their potential contribution to students' questioning and reasoning abilities, and the challenges associated with their implementation.

The official NEP 2020 document was examined separately to identify its provisions concerning experiential learning, critical thinking, scientific temper, competency development, inquiry, and learner-centred pedagogical practices.

Data Analysis and Interpretation

The collected secondary data were analysed using qualitative thematic analysis. Thematic analysis is a flexible qualitative method for identifying, organising, and interpreting recurring patterns or themes within textual data (Braun and Clarke, 2006).

The analysis was conducted through the following broad stages:

First, the selected literature and documentary sources through repeated reading and review.

Second, relevant statements, arguments, findings, and recommendations were identified and assigned initial codes according to their relevance to the research questions.

Third, related codes were grouped into broader categories representing recurring ideas across the literature.

Fourth, these categories were examined and developed into major themes concerning innovative pedagogical practices, scientific temper, critical inquiry, learner engagement, evidence-based reasoning, and NEP 2020.

Finally, the identified themes were interpreted comparatively to determine areas of convergence, differences in perspectives, emerging trends, and gaps in the existing literature.

The analysis particularly focused on the relationship between innovative pedagogical practices and the development of scientific temper and critical inquiry. Attention was also given to how inquiry-oriented, experiential, collaborative, project-based, problem-based, and technology-supported approaches may create opportunities for students to question, investigate, reason, evaluate evidence, solve problems, and construct scientific understanding.

Thematic Framework of Analysis

For systematic interpretation of the secondary literature, the analysis was organised around the following broad thematic areas (Table 1):

This thematic framework provided a structured basis for synthesising findings from different sources while maintaining alignment with the objectives and research questions of the study.

RESULTS AND DISCUSSION

This section discusses how innovative pedagogies can support scientific temper, critical inquiry, questioning, reasoning, investigation, evidence-based thinking, and problem solving in school science education. It also examines their alignment with NEP 2020 and the challenges involved in implementation.

Innovative Pedagogies and the Development of Scientific Temper

Innovative pedagogies promote questioning, investigation, experimentation, discussion, collaboration, and application of knowledge. These processes support scientific temper by developing curiosity, rationality, openness to evidence, and critical examination of assumptions.

Inquiry-based learning helps students identify problems, formulate questions, examine evidence, and develop explanations. Experiential, project-based, and problem-based learning connect scientific concepts with real-life situations and encourage students to apply knowledge to practical problems.

Collaborative learning enables students to exchange explanations, consider different viewpoints, defend their ideas, and revise their understanding. Technology-supported learning provides access to simulations, digital resources, visualisations, and interactive activities. However, technology is effective only when combined with meaningful questioning, investigation, collaboration, and reflection.

Thus, innovative pedagogy develops scientific temper when students are encouraged to observe,

Table 1 : Major Thematic Areas Examined in the Study

Major Theme	Areas Examined
Innovative Pedagogies	Inquiry-based, experiential, project-based, problem-based, collaborative, activity-based and technology-supported learning
Scientific Temper	Curiosity, questioning, observation, experimentation, rationality, objectivity and evidence-based thinking
Critical Inquiry	Question formulation, investigation, analysis, evaluation of evidence, reasoning and conclusion formation
Learner-Centred Science Education	Active participation, student agency, collaboration, exploration and problem solving
NEP 2020	Experiential learning, competency-based education, critical thinking, scientific temper and learner-centred pedagogy
Implementation Issues	Teacher preparedness, resources, infrastructure, curriculum demands, assessment practices and digital access
Research Gaps	Underexplored areas, methodological limitations and areas requiring further empirical investigation

question, investigate, analyse, discuss, justify, and reflect.

Questioning, Reasoning, and Evidence-Based Thinking

Innovative approaches strengthen reasoning by involving students in constructing, examining, and evaluating knowledge. Inquiry-based teaching encourages learners to formulate questions and investigate possible explanations.

Scientific temper requires students to distinguish evidence-based explanations from unsupported assumptions. Students therefore need opportunities to examine claims, compare explanations, identify evidence, and recognise limitations.

Argumentation and classroom discussion support critical inquiry. When students explain conclusions, justify claims, consider alternatives, and revise ideas, they develop higher-order thinking. Problem-based and interdisciplinary learning promote analysis, decision-making, and practical application. However, innovative activities are effective only when students participate meaningfully in question formulation, evidence gathering, interpretation, discussion, and reflection.

Alignment of Innovative Pedagogy with NEP 2020

Innovative pedagogies align closely with NEP 2020, which emphasises experiential, competency-oriented, holistic, multidisciplinary, and learner-centred education. Inquiry-based learning supports questioning and investigation. Experiential learning connects theory with practice. Project-based learning promotes application and problem solving. Collaborative learning develops communication and multiple perspectives. Technology-supported learning expands access to learning resources.

NEP 2020 requires a shift from memorisation towards questioning, investigation, explanation, evaluation, application, and creation. Science education can support this shift through experimentation, observation, discussion, problem solving, and reflection.

Opportunities Provided by Innovative Pedagogies

Innovative pedagogies provide the following opportunities:

- Increase student engagement through active and meaningful learning.
- Promote experimentation, observation, projects, simulations, and problem solving.
- Develop analysis, evidence evaluation, comparison, decision-making, and justification.
- Connect science with health, environment, technology, energy, climate, and society.
- Encourage collaboration, communication, creativity, and independent learning.
- Support the application of scientific knowledge in practical situations.
- Expand access to digital resources, simulations, visualisations, and information sources.
- Develop curiosity, rationality, and evidence-based judgement.

These benefits depend on effective planning, teacher support, suitable assessment, and equitable access to resources.

Challenges in Implementing Innovative Pedagogies

Teacher Preparedness: Teachers need preparation in inquiry-based teaching, project design, classroom discussion, formative assessment, technology integration, and collaborative learning. Without adequate preparation, innovative activities may become superficial.

Time and Curriculum Pressure: Inquiry, experimentation, projects, discussion, and reflection require more time than direct instruction. Syllabus completion and examination preparation may limit their use.

Resources and Infrastructure: Laboratories, teaching-learning materials, digital devices, internet connectivity, and suitable classroom spaces influence implementation. Unequal infrastructure may create unequal learning opportunities.

Digital Inequality and Learner Well-Being: Unequal access to devices and connectivity may disadvantage some learners. Excessive screen use may also cause digital fatigue, psychological stress, and reduced social interaction. Technology should complement hands-on learning and human interaction.

Assessment Practices: Assessment systems focused mainly on memorisation may restrict inquiry, collaboration, experimentation, and problem-based learning. Teachers need assessment methods that recognise reasoning, creativity, communication, and evidence evaluation.

Classroom Management: Inquiry and collaborative activities may create challenges related to group participation, noise, time management, and monitoring. Teachers need effective strategies to ensure meaningful participation by all students.

Innovative pedagogy can support scientific temper and critical inquiry when students actively ask questions, investigate problems, analyse evidence, discuss explanations, evaluate alternatives, and reflect on conclusions. NEP 2020 provides a supportive framework for this transformation. However, implementation requires teacher preparation, curriculum flexibility, appropriate assessment, adequate resources, equitable technology access, effective classroom management, and institutional support. Scientific temper and critical inquiry should be integrated into science learning rather than treated as additional objectives. Consistent opportunities to question, explore, test, reason, discuss, evaluate evidence, and apply knowledge can help develop rational, reflective, and responsible learners.

The discussion supports the following conceptual progression:

Innovative Pedagogical Practices

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Active, Experiential, and Inquiry-Oriented Learning

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Questioning + Investigation + Evidence Analysis + Discussion + Problem Solving

↓

Scientific Temper + Critical Inquiry

↓

Rational Thinking + Critical Reasoning + Evidence-Based Decision-Making

Thoughtfully designed innovative pedagogies, implemented within the vision of NEP 2020, can help learners understand scientific concepts, think scientifically, evaluate evidence, and make reasoned decisions in academic and everyday contexts.

Conclusion

The present study examined the potential of innovative pedagogies for developing scientific temper and critical inquiry among school students in the light of NEP 2020. The analysis of secondary literature indicates that inquiry-based, experiential, project-based, problem-based, collaborative, interdisciplinary, and technology-supported approaches can make science learning more active, meaningful, and learner-centred. These approaches provide students with opportunities to ask questions, investigate problems, examine evidence, discuss different explanations, solve problems, and apply scientific knowledge to real-life situations. Such experiences can nurture curiosity, logical reasoning, critical thinking, scientific literacy, and evidence-based decision-making. The findings also show a strong alignment between innovative pedagogy and NEP 2020, particularly its emphasis on experiential learning, competency development, critical thinking, creativity, problem solving, and holistic education.

However, the successful implementation of innovative pedagogies requires more than introducing new teaching techniques or digital tools. Teacher preparedness, adequate resources, curriculum flexibility, appropriate assessment practices, infrastructure, equitable access to technology, and institutional support are essential for meaningful implementation. Since the present study is based exclusively on secondary sources, its conclusions represent an interpretive synthesis of existing research and policy documents rather than direct evidence from teachers or students. Therefore, the study concludes that scientific temper and critical inquiry should become an integral part of everyday science learning rather than being treated as additional outcomes. When students are consistently encouraged to question, explore, experiment, reason, evaluate evidence, and reflect on their conclusions, science education can contribute to the development of curious, rational, responsible, and independent learners who are better prepared to respond thoughtfully to academic, social, and real-life challenges.

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