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Integrating Nyaya and Tarka Shastra into Critical Thinking Pedagogy: An IKS-Informed Framework for NEP 2020 School Education

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Abstract

The National Education Policy (NEP) 2020 emphasises the integration of Indian Knowledge Systems (IKS) into mainstream curricula while simultaneously emphasising critical thinking as a core competency for 21st-century learners. However, there remains scope for systematic conceptual work examining how Indian reasoning traditions can inform contemporary critical thinking pedagogy. This paper adopts a conceptual analytical approach and explores how traditional Indian intellectual frameworks can systematically develop critical thinking and its key dimensions – analysis, evaluation, inference and self -regulation. Drawing inferences from the suggested classical Indian traditional methods Nyaya philosophy and Tarka Shastra for developing logical reasoning, Shastrartha and Samvada for dialogic enquiry, metacognition and self-regulation- the paper argues that these traditions contain systematic epistemological and dialogic practices that can inform contemporary approaches to critical thinking pedagogy. The paper conceptually maps these practices into contemporary theories of critical thinking, higher-order cognition, metacognition and inclusive pedagogy. By this integration, the paper suggests that educational practices can shift to a more culturally responsive, cognitively engaging and holistically developmental educational practices as envisaged by NEP 2020. The paper also addresses the practical implementation pathways, including curriculum design, teacher training, assessment approaches and challenges related to implementation. Thus, this paper positions IKS as a strategic pedagogic innovation, finding the roots of our culture and aligning it with the global best practices in critical thinking development and inclusive education.

Keywords:
Indian Knowledge Systems (IKS), critical thinking, Nyaya Philosophy, Tarka Shastra, pedagogical integration, NEP 2020, holistic development.

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Introduction

Critical thinking has become an increasingly important educational priority as school learners are expected not only to acquire information but also to examine evidence, analyse claims, consider alternative explanations and arrive at reasoned judgments. In the Indian educational context, these priorities are particularly relevant to the vision of the National Education Policy (NEP) 2020, which advocates a shift from rote-oriented learning towards inquiry, critical thinking, multidisciplinary understanding and holistic development.

At the same time, NEP 2020 provides explicit scope for the incorporation of Indian Knowledge Systems (IKS) and traditional ways of learning into the curriculum in an accurate and scientific manner wherever relevant. Among the classical Indian philosophical traditions, the Nyaya school is particularly relevant to this discussion because of its systematic treatment of knowledge, inference, reasoning, argumentation and the identification of erroneous reasoning. Concepts such as Pratyakṣa, Anumana, Upamana and Sabda address different means through which knowledge may be established, while Tarka provides a mode of hypothetical reasoning and Hetvabhasa provides a framework for recognising defective reasoning. Dialogic practices such as Vada and Samvada further provide possibilities for developing reasoned argumentation and evidence-based classroom discourse.

Despite this potential, the educational relevance of classical Indian reasoning traditions requires careful conceptual translation. Historical philosophical concepts should not simply be equated with contemporary psychological constructs, nor should modern neuroscience be used to provide unsupported biological explanations for traditional practices. What is required is a theoretically grounded mapping that identifies meaningful correspondences while recognising the differences between philosophical systems and contemporary educational theories.

Against this background, the present conceptual paper examines how selected Nyaya–Tarka principles can inform critical-thinking pedagogy in school education. It analyses the relationship between classical Indian reasoning practices and contemporary processes such as observation, inference, evidence evaluation, argument analysis, fallacy detection, dialogue and reflective judgment. The paper subsequently maps these practices onto contemporary pedagogical frameworks and considers their alignment with the priorities of NEP 2020. The paper proposes a conceptual framework rather than claiming empirical effectiveness, thereby providing a basis for future classroom-based research on culturally grounded approaches to critical-thinking development.

Methodology

This paper adopts a conceptual-analytical research approach to examine the pedagogical relevance of selected classical Indian reasoning traditions, particularly Nyaya and Tarka Sastra, for critical-thinking development in school education. The analysis draws upon three categories of sources: classical and scholarly literature on Indian philosophy and logic; contemporary literature on critical thinking, cognition, metacognition and inclusive pedagogy; and policy documents, particularly the National Education Policy (NEP) 2020. Relevant concepts were identified through purposive examination of these sources and thematically organised around knowledge validation, inference, hypothesis testing, argumentation, fallacy identification, dialogue and reflective reasoning. A conceptual mapping procedure was then used to relate selected Nyaya–Tarka practices to contemporary critical-thinking processes and pedagogical strategies. The analysis also examined their potential alignment with the curricular and pedagogical priorities articulated in NEP 2020. The resulting framework is therefore interpretive and theoretically derived rather than empirically validated. The proposed pedagogical correspondences should be regarded as hypotheses for future classroom-based investigation rather than as evidence of demonstrated effectiveness.

Conceptual and Philosophical Foundations

Rather than attempting to represent the entire range of Indian philosophical traditions, this paper focuses primarily on Nyaya and Tarka Sastra because of their explicit concern with

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knowledge, inference, reasoning, argumentation and evaluation of claims.

Nyaya and the Logic of Valid Knowledge

The Nyaya school is one of the six traditional orthodox (Astika) systems of Indian philosophy, and is traditionally attributed to the sage Aksapada Gautama, the author of the Nyaya Sutra. In the metaphysical nature, Nyaya is allied to the Vaisheshika system, and the two schools are often combined from about 10th century. The principal text is the Nyaya - sutras, by Gautama (c.2nd century BCE). Nyaya is a philosophical school or system and Tarka Sastra- the science of logic and reasoning or argumentative procedure within the Nyaya epistemological tradition, also referred to as Anviksiki- the science of critical study. Tarka is a cognitive act that validates content (of a doubt, a cognition or a speech) by demonstrating its logical unfitness.

Pramana – Sources and Evaluation of Knowledge

The four valid means of acquiring knowledge (pramana) according to Nyaya Philosophy are Pratyaksha (perception), Anumana (inference), Upamana (comparison), and Sabda (reliable testimony). Pratyaksha (perception), arises by means of the connection between sense faculty and object and is not dependent on words. Anumana (inference) is Deductive logical reasoning preceded by perception and is threefold from cause and effect, from effect to cause and from that which is commonly seen. Upamana is comparison or analogy in which knowledge is gained through resemblance or analogical reasoning. Sabda is reliable verbal testimony in which knowledge is obtained from authoritative and reliable testimony or sound.

Applying the Pramaṇa system to modern classrooms provides an epistemological framework to foster critical thinking. The Pramaṇa framework evaluates how knowledge is acquired (Prama), verified (Pramaṇatva), and distinguished from error (Aprama). In Indian epistemology (Pramana-sasthra), the analysis of human cognition revolves around a foundational triadic framework that evaluates how knowledge is acquired (Prama), verified (Pramaṇatva), and distinguished from error (Aprama) (Chatterjee & Datta, 2007; Matilal, 1998). This systematic classification ensures that valid cognition is clearly demarcated from false or doubtful mental states.

Prama or valid knowledge denotes valid, non-receptive, and true cognition or yathartha anubhava (Chatterjee & Datta, 2007). In classical Indian systems, particularly Nyaya, cognition or Jnana qualifies as Prama only if it meets three main criteria (Phillips, 2012), First is Truth Correspondence (Yatharthatva), the cognitive representation accurately reflects the object as it exists in reality; second is Novelty (Anadhigatatva) the knowledge that provides new informational value rather than relying solely on memory recollection (Smṛti); and finally the Uncontradicted Status (Abadhitatva) the cognition remains completely true if it cannot be proven wrong or corrected by new, more authoritative evidence.Indian philosophical schools divide on how Pramanatva originates.

- Aprama (Invalid Cognition and Error) compromising all cognitive states that fail to meet the standards of valid knowledge (Pramā) (Chatterjee & Datta, 2007). Rather than indicating a total absence of awareness, it includes flawed, ambiguous, or incomplete mental states (Matilal, 1998).
- Doubt (Saṃsaya): An uncommitted cognitive state oscillating between opposing options regarding the same object.
- Hypothetical Reasoning (Tarka): Suppositional or counterfactual arguments used as secondary aids to test hypotheses, categorized under Apramā because they do not yield direct, definitive presentation (Phillips, 2012).
- Memory (Smṛti): Classified under Apramā in most orthodox schools because it derives from past impression traces (Saṃskāras) rather than direct, presentational contact with an object (Chatterjee & Datta, 2007).

Classroom Applications of Nyaya Epistemology for Enhancing Critical Thinking

Nyaya philosophy, centred on epistemology and valid cognition prama, Nyaya establishes four legitimate instruments of knowledge or Pramana. These concepts provide

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a potentially useful structure for organising classroom activities involving evidence evaluation, inference, argument analysis and reasoned judgement. Nyaya integrates a five-membered syllogism featuring the hetu (reason or ground) to connect the minor and major terms, alongside tarka (hypothetical or counterfactual reasoning) to eliminate competing hypotheses and refine dialectical inquiry. Together, these logical features construct a comprehensive epistemological framework dedicated to verifying truth, identifying logical fallacies (hetvabhasa), and ultimately achieving liberation (apavarga) from misconception.

Shastrartha and Samvada for Dialogic Inquiry

Rooted in classical Indian epistemology (Pramana-Sastra), Samvada represents a cooperative, truth-oriented dialogue between teacher and student, whereas Sastrartha serves as a rigorous, structured debate aimed at evaluating opposing arguments through logical analysis (Tarka). Philosophically, these methods reject dogmatic assertion, asserting that valid cognition (Prama) arises through dialectical examination and the systematic elimination of fallacies (Hetvabhasa) (Vaidya, 2017). In contemporary classrooms, educators operationalize these foundations by establishing structured "Samvada Circles" for collaborative text analysis and conducting mock Sastrartha debates. Students practice generating counter-arguments, identifying logical contradictions, and grounding claims in empirical evidence (Pratyakṣa) and valid inference (Anumana), transforming passive learning into active, evidence-backed inquiry (CN, S. 2025).

Strategies to apply Nyaya epistemology and Tarka Shastra in Indian classrooms:

- Socratic Debates (Vada): Replace rote learning with structured, truth-seeking group discussions, teaching students to evaluate evidence rather than argue for victory (Jalpa).
- Case-Based Reasoning (Panchavayava): Integrate the five-step Indian syllogism into subjects like Science and Social Studies to train students in drawing evidence-backed conclusions from premises (hetu).
- Fallacy Detection (Hetvabhasa): Teach students to spot logical fallacies in media, history, and everyday reasoning, sharpening critical thinking.
- Hypothetical Testing (Tarka): Encourage "what-if" counterfactual scenarios to test assumptions before arriving at final decisions (Nirṇaya).
- Perception (Pratyakṣa): Direct Observation Labs in science or observation-based tasks, students differentiate between direct sensory evidence and secondary assumptions. Students learn to record observed phenomena without letting unverified inferences cloud their primary data (Chatterjee & Datta, 2007).
- Inference (Anumana): Deductive and Causal Reasoning in which teachers scaffold logical deduction using cause-and-effect reasoning (Karya-Karaṇa). Students practice tracing an outcome back to its probable cause (e.g., historical analysis or experimental troubleshooting) and vice versa (Phillips, 2012).
- Comparison (Upamana): Analogical Analysis can be applied in problem-solving tasks, students use comparative reasoning to map familiar concepts onto unfamiliar domains, while explicitly evaluating where the analogy succeeds and where it breaks down.
- Testimony (Sabda): Authoritative Source Auditing where students evaluate news articles, academic papers, and digital content by testing the credibility, expertise, and potential bias of the source (Apta) (Matilal, 1998).

Table 1: Mapping Nyaya – Tarka Practices to Critical Thinking Pedagogy

Nyaya Concept	Pedagogical Strategy	Classroom Critical- Thinking Process
Pratyaksa	Observation task	Observation/Evidence
Anumana	Casual Reasoning	Inference

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Upamana	Analogy Task	Analogy/Comparison
Sabda	Source Evaluation	Source Credibility/Testimony
Tarka	What – if Reasoning	Hypothesis Testing
Hetvabhasa	Fallacy Analysis	Fallacy Detection
Vada	Structured Dialogue	Reasoned Dialogue

Conceptual Mapping with Contemporary Educational Frameworks

Contemporary educational psychology has established that self-regulated learning and metacognition represent central mechanisms through which critical thinking develops and improves academic achievement. The Gurukula system's emphasis on the student's conscious engagement in learning, combined with the Guru's guidance in reflection and evaluation, operated as a self-regulated learning model structured through mentoring relationships. The student's responsibility for their own learning, combined with guided reflection on progress, mirrors contemporary understanding of how self-regulation develops.

In Tarkasastra, the formal identification of Hetvabhasa (pseudo-reasons or fallacies) is an inherently metacognitive task. When a student evaluates whether an argument contains a circular reasoning fallacy (atmasraya) or an unestablished premise (Asiddha), they are actively monitoring cognitive validity and regulating their own epistemic processing (Chatterjee & Datta, 2007; Flavell, 1979).

Constructivist learning theory asserts that knowledge is actively constructed by the learner through interaction with the environment, rather than passively received (Vygotsky, 1978). This directly aligns with the Nyaya view that valid cognition (Prama) requires an active, structured interaction between the learner, the sense organs, and the object (Sannikarṣa) (Chatterjee & Datta, 2007). The two-stage perceptual theory—isolating raw, uninterpreted sensory data (Nirvikalpaka) from categorized conceptual judgment (Savikalpaka). This can be conceptually compared with constructivist accounts of learning in which learners actively organise and interpret experience. In the classroom, guiding learners through Nirvikalpaka observation before moving to Savikalpaka conceptualization prevents premature cognitive closures and biases.

In Inquiry-Based and Problem-Based Learning by John Dewey has reflective thinking begins with a state of doubt or perplexity, prompting systematic inquiry (Dewey, 1933). It has conceptual correspondence with Tarka sastra, termed Saṃsaya (doubt), which acts as the essential starting point for all investigation (Anvikṣiki) (Ganeri, 2001; Matilal, 1998). The dialectical procedure of Tarka (counterfactual reasoning) allows inquiry-based classrooms to test hypotheses. When students encounter an ambiguous problem, they use Prasanga to demonstrate how false assumptions lead to absurdities, isolating valid solutions through systematic elimination (Phillips, 2011).

Dual-Process Theory of Cognition (Kahneman,2011) states the two modes of thought: System 1 (fast, automatic, heuristic-driven) and System 2 (slow, deliberate, analytical). Raw human perception and intuitive jumps often rely on System 1, making them prone to cognitive biases and logical fallacies (Hetvabhasa). Structured Tarka-based activities may encourage learners to slow down intuitive judgements and engage in more deliberate evaluation of evidence and assumptions. Structured Tarka – based activities may encourage learners to slow down intuitive judgements and engage in more deliberate evaluation of evidence and assumptions.

Contemporary cognitive science provides a useful explanatory lens for understanding why structured observation, inference, argument evaluation, reflection and error detection may support higher – order cognition. However, these correspondences should be understood as theoretical rather than as evidence that specific Nyaya -based classroom activities directly produce measurable changes in particular brain regions.

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Universal Design for Learning (UDL) Integration: Flexibility and Inclusion

Universal Design for Learning provides a contemporary framework for creating flexible, accessible learning environments responsive to diverse learner needs. (Selvi et al., 2023) describes UDL as a catalytic approach for addressing various learning needs through offering multiple ways for students to be represented with information, engaged in learning, and enabled to express their understanding. The three UDL principles—multiple means of representation, engagement, and action or expression—align with how classical Indian pedagogical systems simultaneously employed multiple sensory modalities and engagement modes.

(Choi & Seo, 2024) clarifies that inclusive learning design emerges from interplay between accessibility and usability—that truly inclusive design must be grounded from inception in understanding learner variability rather than retrofitting accommodations. A contemporary UDL lens can be used to examine how Nyaya informed activities might be offered through multiple forms of representation, participation and expression.

Mapping Traditional Practices to Modern Critical Thinking Taxonomies

Modern critical thinking frameworks, including extensions of Bloom's taxonomy emphasizing higher-order thinking, can be systematically aligned with classical Indian pedagogical approaches. Analysis and evaluation—high levels in cognitive taxonomies—map directly onto the analytical requirements of Shastrartha debate and Nyaya logical inference. Application of knowledge to novel situations aligns with the Gurukula emphasis on moving from theoretical understanding to practical wisdom.

(Mishra & Aithal, 2023) explicitly compare ancient Vedic educational approaches with Bloom's taxonomy, noting that ancient systems, like contemporary cognitive science, recognized three domains of learning (cognitive, affective, psychomotor) and emphasized development of higher-order thinking through building on foundational cognitive skills. This parallel suggests that IKS integration does not represent abandonment of contemporary educational science but rather recognition that these principles have deep roots in Indian intellectual history.

The integration of moral and ethical reasoning—central to traditional Indian pedagogy through exposure to Dharma texts, Panchatantra stories, and ethical mentoring—represents development in the affective and values domain that many contemporary critical thinking frameworks inadequately address. Including explicit integration of ethical reasoning and values development within critical thinking frameworks creates more holistic development.

Mapping Nyaya and Tarka-Sastra to the Revised Bloom's Taxonomy

The Revised Bloom's Taxonomy classifies cognitive processes across two dimensions: the Cognitive Process Dimension (Remember to Create) and the Knowledge Dimension (Factual, Conceptual, Procedural, Metacognitive) (Anderson & Krathwohl, 2001). Nyaya and Tarka Sastra map onto this taxonomy, providing conceptual accordance with the operational mechanics for each cognitive level.

Integrating classical Indian epistemology with Bloom's taxonomy reveals how structured cognitive training systematically activates key brain networks to deepen learning (Immordino-Yang & Damasio, 2007). At the initial levels, retrieving factual details (Remembering) relies on uninterpreted sensory observation (Nirvikalpaka Pratyakṣa) and memory recall (Smṛti), which engage primary sensory cortices and the hippocampus (Dehaene, 2020). As learners progress to Understanding, they process conceptual knowledge through categorizing observations (Savikalpaka Pratyakṣa) and evaluating authoritative sources (Sabda), activating temporal lobe semantic networks and deliberate thinking systems (Kahneman, 2011). Applying procedural knowledge involves mapping universal rules (Vyapti) and analogies (Upamana) to novel contexts, which utilizes existing schemas and left prefrontal analogical reasoning (Sweller, 1988). Higher-order skills demand more complex cognitive control: Analyzing breaks down arguments using the five-step Indian syllogism (Anumana), engaging the frontoparietal

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network to support relational reasoning and working memory (Goel, 2007). Furthermore, Evaluating requires auditing claims for logical fallacies (Hetvabhasa) and counterfactual testing (Tarka), triggering conflict monitoring in the anterior cingulate cortex (Carter & van Veen, 2007). Finally, Creating synthesizes diverse evidence into a cohesive thesis (Siddhanta) through collaborative debate (Vada), fully mobilizing executive control and frontopolar networks to foster high-level metacognitive integration (Immordino-Yang & Damasio, 2007).

Table.2 A conceptual correspondence drawn between selected Nyaya Tarka processes and levels of the Revised BloomsTaxonomy.

Revised Bloom's Level	Nyaya & Tarka Sastra Equivalent
Creating	Vada & Siddhanta (Formulating Thesis)
Evaluating	Tarka & Hetvabhasa (Fallacy Checking)
Analyzing	Anumana (5-Step Pancavayava)
Applying	Upamana (Analogy) & Vyapti Mapping
Understanding	Savikalpaka Pratyakṣa & Sabda (Apta)
Remembering	Nirvikalpaka Pratyakṣa & Smṛti

The integration of classical Indian epistemology (Nyaya and Tarka Sastra) alongside modern cognitive science and the Revised Bloom's Taxonomy aligns directly with the vision of India's National Education Policy (NEP) 2020 (Ministry of Education, 2020). NEP 2020 explicitly advocates for shifting away from rote learning toward critical thinking, inquiry-based learning, multi-perspective analysis, and the integration of Indian Knowledge Systems (IKS) into mainstream curricula (Ministry of Education, 2020).

Educational Implications of Operationalizing Indian Knowledge Systems (IKS) Through Practical Pedagogy

NEP 2020 (Section 4.27) calls for embedding Indian Knowledge Systems into school and higher education in a scientific, rigorous manner rather than as passive history (Ministry of Education, 2020). Combining Nyaya's four Pramaṇas (perception, inference, analogy, testimony) with Tarka Sastra provides educators with a practical, step-by-step methodology for teaching critical reasoning. Rather than learning ancient philosophy as static lore, students use the 5-step Nyaya syllogism (Pancavayava) to structure scientific lab reports, persuasive essays, and analytical research projects (Chatterjee & Datta, 2007; Matilal, 1998).

The pedagogical relevance of Nyaya and Tarka Sastra lies in their potential to translate principles of observation, inference, evidence evaluation, reasoning and dialogue into contemporary classroom practices. Rather than introducing classical Indian logic merely as philosophical content, selected concepts can be embedded within existing inquiry-based, experiential and discussion-oriented pedagogies. Pratyakṣa can inform structured observation activities in which learners distinguish direct evidence from assumptions, while Anumana can be used to develop evidence-based inference and causal reasoning. Upamana can support comparative and analogical reasoning, whereas Tarka can be incorporated through hypothetical and counterfactual questions that encourage learners to examine assumptions and consider alternative explanations. Similarly, the identification of Hetvabhasa can provide opportunities for students to recognise weaknesses or fallacies in arguments. Vada and Samvada can further support structured classroom dialogue in which learners present claims, provide reasons, examine counter-arguments and revise their positions on the basis of evidence. Such practices can shift classroom interaction from answer reproduction towards reasoned inquiry and argumentation.

These principles also have implications for assessment. If

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critical thinking is to be developed as an educational outcome, assessment should provide opportunities for learners to demonstrate how they arrive at conclusions rather than merely reproduce information. Tasks may therefore require students to identify evidence, establish relationships between evidence and claims, examine alternative explanations, identify weaknesses in reasoning and justify conclusions. Such reasoning-focused assessment can be incorporated into written responses, case analyses, projects, discussions and structured argumentation tasks. Teacher education is equally important for meaningful implementation. Student-teachers and practising teachers may be introduced to selected Nyaya–Tarka concepts through workshops, demonstration lessons and microteaching, followed by opportunities to design age-appropriate activities involving observation, inference, argument analysis and evidence evaluation. This would also help prevent the treatment of Indian Knowledge Systems either as purely historical content or as unverified educational claims. Finally, the principles have contemporary relevance for digital and media literacy. Students can apply source evaluation, evidence checking, inference and fallacy identification when examining information encountered through websites, social media, advertisements and other digital platforms. Thus, Nyaya–Tarka principles can function as a culturally grounded conceptual resource for developing evidence-informed reasoning across classroom learning, assessment, teacher preparation and information evaluation. However, these applications remain conceptually proposed and require empirical investigation before claims regarding their effectiveness in developing critical thinking can be established.

Implementation Challenges

Despite the structural alignment between classical epistemological frameworks and NEP 2020, implementing this approach across the Indian educational landscape faces several systemic challenges:

Prevalence of Examination-Driven Rote Learning and High-stakes standardized examinations (e.g., board exams and competitive entrance tests) continue to prioritize speed and memorization over reflective reasoning, creating resistance to time-intensive inquiry methods (Central Board of Secondary Education, 2023).

Teacher Professional Development Gaps: Most educators lack formal training in both classical dialectical methods (Tarka Sastra) and modern cognitive or neuroscience-backed pedagogy. Without substantial faculty development programs, teachers may revert to traditional lecturing (Ministry of Education, 2020).

Large Class Sizes and Infrastructure Deficits: Implementing collaborative, inquiry-based debate (Vada) and individual argumentation scaffolding is difficult in overcrowded classrooms with high student-to-teacher ratios (World Bank, 2021).

Risk of Misinterpretation or Ideological Resistance: Integrating classical Indian philosophical frameworks requires careful secular, academic handling to prevent it from being viewed either as religious instruction or superficial cultural promotion, ensuring it is valued for its genuine cognitive utility (Ganeri, 2001).

Conclusion

The analysis indicates that selected principles from the Nyaya–Tarka tradition offer potentially valuable conceptual resources for contemporary critical-thinking pedagogy. Pratyakṣa can inform careful observation and evidence gathering; Anumana can support inferential and causal reasoning; Upamana can encourage comparative and analogical thinking; Sabda can provide a basis for evaluating the credibility of sources; Tarka can support the examination of assumptions and alternative explanations; and the analysis of Hetvabhasa can be used to develop awareness of defective reasoning. Dialogic practices such as Vada and Samvada further provide opportunities for students to articulate claims, examine counter-arguments and engage in reasoned discussion.

The significance of these traditions in contemporary education lies not in claiming that classical Indian logic anticipated modern educational psychology, but in recognising that Indian intellectual traditions contain systematic approaches to

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knowledge, reasoning and argumentation that can be meaningfully examined within present educational contexts. When carefully translated into age-appropriate classroom practices, these principles may complement contemporary approaches to inquiry, argumentation, evidence evaluation and reflective learning.

The proposed framework is also consistent with important directions of NEP 2020, particularly its emphasis on critical thinking, inquiry, multidisciplinary learning and the accurate and scientific incorporation of Indian Knowledge Systems. However, conceptual correspondence should not be mistaken for empirical evidence. The effectiveness of Nyaya–Tarka-informed pedagogies need to be established through systematic classroom research involving appropriate learning outcomes, validated assessment instruments and context-sensitive implementation.

References

1. Anderson, L. W., & Krathwohl, D. R. (Eds.). (2001). *A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives*. Longman.
2. Britannica Editors. (2024). *Nyaya: Logic, epistemology, ethics*. Encyclopædia Britannica. https://www.britannica.com/topic/Nyaya
3. Carter, C. S., & van Veen, V. (2007). Anterior cingulate cortex and conflict detection: An update of theory and data. *Cognitive, Affective, & Behavioral Neuroscience*, *7*(4), 367–379. https://doi.org/10.3758/CABN.7.4.367
4. Central Board of Secondary Education. (2023). *Competency-based education framework for secondary level*. Government of India.
5. Chatterjee, S., & Datta, D. (2007). *An introduction to Indian philosophy*. University of Calcutta.
6. Choi, G. W., & Seo, J. Y. (2024). Accessibility, usability, and Universal Design for Learning: Discussion of three key LX/UX elements for inclusive learning design. *TechTrends*, *68*(5), 936–945. https://doi.org/10.1007/s11528-024-00987-6
7. Dehaene, S. (2020). *How we learn: The new science of education and the brain*. Viking.
8. Dewey, J. (1933). *How we think: A restatement of the relation of reflective thinking to the educative process*. D. C. Heath and Company.
9. Flavell, J. H. (1979). Metacognition and cognitive monitoring: A new area of cognitive–developmental inquiry. *American Psychologist*, *34*(10), 906–911. https://doi.org/10.1037/0003-066X.34.10.906
10. Ganeri, J. (2001). *Philosophy in classical India: The proper work of reason*. Routledge.
11. Goel, V. (2007). Anatomy of deductive reasoning. *Trends in Cognitive Sciences*, *11*(10), 435–441. https://doi.org/10.1016/j.tics.2007.09.003
12. Immordino-Yang, M. H., & Damasio, A. (2007). We feel, therefore we learn: The relevance of affective and social neuroscience to education. *Mind, Brain, and Education*, *1*(1), 3–10. https://doi.org/10.1111/j.1751-228X.2007.00004.x
13. Kahneman, D. (2011). *Thinking, fast and slow*. Farrar, Straus and Giroux.
14. Matilal, B. K. (1998). *The character of logic in India* (J. Ganeri & H. Tiwari, Eds.). State University of New York Press.
15. Ministry of Education. (2020). *National Education Policy 2020*. Government of India. https://www.education.gov.in/sites/upload_files/mhrd/files/NEP_Final_English_0.pdf
16. Mishra, N., & Aithal, P. S. (2023). Modern multidisciplinary education: Challenges and opportunities of modern learning pedagogy. *International Journal of Case Studies in Business, IT, and Education (IJCSBE)*, *7*(4), 481–496. https://doi.org/10.5281/zenodo.10398638
17. Mohanty, J. N. (2000). *Classical Indian philosophy*. Rowman & Littlefield Publishers.
18. Mohanty, J. N. (2024). *Indian philosophy*. Encyclopædia Britannica. https://www.britannica.com/topic/Indian-philosophy
19. Narasimhan, L., Nagarathna, R., & Nagendra, H. R. (2019). Educational applications of Yoga and Upanishadic

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wisdom for cognitive development and emotional regulation. *International Journal of Yoga*, *12*(3), 181–189. https://doi.org/10.4103/ijoy.IJOY_81_18

20. Nirmal, C. N., & Sistla, R. (2025). Study of logic in management education: Use of Tarka Shastra and Nyaya philosophy. Advanced International Journal for Research, 6(4). DOI: 10.63363/aijfr. 2025.v06i04.1204.
21. Phillips, S. (2011). Epistemology in classical Indian philosophy. In E. N. Zalta (Ed.), *The Stanford Encyclopedia of Philosophy*. Stanford University. https://plato.stanford.edu/entries/epistemology-india/
22. Phillips, S. (2012). *Epistemology in classical India: The knowledge sources of the Nyāya school*. Routledge.
23. Piaget, J. (1952). *The origins of intelligence in children*. International Universities Press.
24. Selvi Anita Mary, G. (2023). Universal Design for Learning (UDL) in diverse classrooms. *Shanlax International Journal of Arts, Science and Humanities*, *11*(S1), 125–132.
25. Sweller, J. (1988). Cognitive load during problem solving: Effects on learning. *Cognitive Science*, *12*(2), 257–285. https://doi.org/10.1207/s15516709cog1202_4
26. Vaidya, A. (2017). Does critical thinking and logic education have a Western bias? The case of the Nyāya school of classical Indian philosophy. *Journal of Philosophy of Education*, *51*(1), 120–143. https://doi.org/10.1111/1467-9752.12232
27. Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press.
28. World Bank. (2021). *Improving school education outcomes in India: Challenges and policy pathways*. World Bank Group.

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