

Impact of Indian Knowledge Systems-Based Pedagogy On Affective Learning Outcomes: A Study Of Secondary School Students In Gujarat, India

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ABSTRACT

The integration of Indian Knowledge Systems (IKS) into contemporary educational frameworks represents a significant pedagogical shift in India's National Education Policy 2020. This research examines how IKS-based teaching methodologies influence affective learning outcomes among secondary school students in Gujarat, India. Affective learning encompasses emotional engagement, cultural identity, value formation, and attitude development—dimensions often overlooked in traditional cognitive-focused assessments. Through a mixed-methods study involving 450 students across twelve secondary schools implementing IKS pedagogy, we measured changes in student motivation, cultural pride, ethical awareness, and learning enthusiasm. The findings reveal that students exposed to IKS-integrated curriculum demonstrated 34% higher scores in affective engagement metrics compared to control groups following conventional teaching methods. Students particularly showed enhanced appreciation for indigenous wisdom, stronger connections to cultural heritage, and improved collaborative learning behaviors. The research identifies specific IKS pedagogical elements—such as experiential learning through ancient texts, value-based storytelling, and contemplative practices—that most significantly impact affective outcomes. This study contributes to understanding how culturally-rooted pedagogies can enhance holistic student development beyond academic achievement, offering practical implications for curriculum designers and educators seeking to implement NEP 2020's IKS integration mandates.

KEYWORDS: Indian Knowledge Systems, Affective Learning, Pedagogy, Secondary Education, Cultural Identity, National Education Policy, Gujarat Education, Indigenous Knowledge

INTRODUCTION

India's National Education Policy 2020 marks a transformative moment in the country's educational landscape by explicitly emphasizing the integration of Indian Knowledge Systems into mainstream curriculum. This policy shift recognizes that education extends beyond cognitive skill development to encompass affective dimensions—the feelings, values, attitudes, and emotional connections that shape how students relate to learning and their cultural identity (Sharma and Devi, 2023). The NEP's emphasis on holistic development acknowledges what ancient Indian educational philosophies have long understood: meaningful learning engages the whole person, not merely the intellect.

Indian Knowledge Systems encompass diverse intellectual traditions spanning philosophy, science, mathematics, arts, and ethics developed over millennia. From the logical rigor of Nyaya philosophy to the astronomical precision of Aryabhata's calculations, from the linguistic sophistication of Panini's grammar to the ethical frameworks of Buddhist and Jain traditions, IKS represents a rich repository of indigenous wisdom. Yet for decades following independence, these knowledge systems remained marginalized in Indian education, relegated to cultural studies rather than integrated into core pedagogy (Krishnan, 2024).

The marginalization created consequences extending beyond lost cultural heritage. Students learned to view indigenous knowledge as antiquated or inferior to Western frameworks, developing a disconnect from their own cultural roots. This disconnection manifests affectively—students feel little emotional investment in learning perceived as culturally alien, lack pride in indigenous intellectual achievements, and miss opportunities to develop values embedded in traditional wisdom (Patel and Shah, 2022).

Recent years have witnessed growing recognition that effective education must be culturally responsive, connecting with students' lived experiences and cultural contexts. Research across diverse global contexts demonstrates that culturally relevant pedagogy enhances student engagement, motivation, and identity development (Kumar and Singh, 2023). For Indian students, IKS-based pedagogy offers potential to create these meaningful cultural connections while transmitting valuable indigenous knowledge.

However, implementing IKS integration faces practical challenges. Teachers require training in IKS content and pedagogy. Curriculum materials need development. Assessment frameworks must expand beyond cognitive testing to measure affective outcomes. Most fundamentally, educators need evidence that IKS integration produces meaningful educational benefits justifying implementation efforts.

This research addresses that evidence gap by examining how IKS-based pedagogy impacts affective learning outcomes among secondary school students in Gujarat. Gujarat offers an particularly relevant context given its rich indigenous knowledge traditions and its state education department's proactive IKS integration initiatives. The state implemented pilot IKS programs in select secondary schools, creating natural experimental conditions for studying pedagogical impacts.

Affective learning outcomes encompass several interconnected dimensions. Emotional engagement reflects students' enthusiasm, interest, and positive feelings toward learning. Cultural identity involves pride in heritage and understanding of indigenous traditions. Value formation includes development of ethical awareness and character qualities emphasized in IKS traditions like compassion, truthfulness, and self-discipline. Attitude development encompasses openness to diverse knowledge systems and appreciation for indigenous wisdom.

Traditional educational research has predominantly focused on cognitive outcomes—test scores, subject mastery, skill development—often neglecting affective dimensions despite their fundamental importance for lifelong learning and holistic development. Students who feel emotionally engaged learn more effectively, persist through challenges, and develop intrinsic motivation. Students with strong cultural identity demonstrate higher self-esteem and resilience. Students who internalize positive values become ethical, responsible citizens.

This study investigates whether and how IKS pedagogical approaches influence these crucial affective outcomes. We examine specific teaching methodologies drawing from IKS traditions—contemplative practices, value-based storytelling, experiential learning with ancient texts, collaborative learning models—to identify which elements most powerfully impact student affect. The research also explores how impacts vary across different student populations, recognizing that cultural backgrounds and prior educational experiences shape pedagogical effectiveness.

The significance extends beyond academic interest. With NEP 2020 mandating IKS integration nationwide, educators and policymakers urgently need evidence-based guidance on implementation. This research provides that guidance by demonstrating concrete affective benefits of IKS pedagogy and identifying effective implementation approaches. The findings inform teacher training programs, curriculum development, and assessment frameworks for schools undertaking IKS integration.

OBJECTIVES

This research pursues the following objectives:

- **Primary Objective:** To assess the impact of Indian Knowledge Systems-based pedagogical approaches on affective learning outcomes among secondary school students in Gujarat, India.
- **Secondary Objective 1:** To identify specific IKS pedagogical elements that most significantly influence student emotional engagement, cultural identity, and value formation.

- **Secondary Objective 2:** To compare affective learning outcomes between students receiving IKS-integrated instruction and those following conventional teaching methodologies.
- **Secondary Objective 3:** To examine how student characteristics such as prior cultural exposure, family background, and academic performance mediate the relationship between IKS pedagogy and affective outcomes.
- **Secondary Objective 4:** To develop evidence-based recommendations for effective implementation of IKS pedagogy in secondary education contexts.

SCOPE OF STUDY

The research scope includes:

- **Geographic Scope:** The study focuses on secondary schools in Gujarat state, India, specifically examining schools in Ahmedabad, Surat, and Vadodara districts that have implemented IKS integration programs.
- **Educational Level:** Research targets students in grades 9-10 (ages 14-16), a critical developmental period for identity formation and value development.
- **Pedagogical Focus:** The study examines IKS integration across multiple subjects including history, science, mathematics, and language arts, rather than limiting analysis to cultural studies or religious education.
- **Outcome Measures:** Research assesses affective outcomes including emotional engagement, cultural identity, value orientation, and learning attitudes, while acknowledging but not primarily measuring cognitive achievement.
- **Temporal Scope:** Data collection spans one academic year (2023-2024) to capture sustained pedagogical impacts rather than short-term novelty effects.
- **Exclusions:** The study does not examine IKS integration at primary or higher education levels, does not assess implementation in other Indian states, and does not evaluate impacts on teacher professional development as a primary outcome.

LITERATURE REVIEW

4.1 Indian Knowledge Systems in Educational Context

Indian Knowledge Systems represent millennia of accumulated wisdom across diverse intellectual domains. The Vedic period established sophisticated systems of mathematics, astronomy, linguistics, and philosophy that influenced global intellectual development (Rao, 2022). Ancient Indian mathematicians developed concepts including zero, decimal notation, and advanced algebraic techniques centuries before their European counterparts. Astronomers accurately calculated planetary movements and eclipse predictions. Grammarians created linguistic frameworks of remarkable sophistication.

Beyond technical knowledge, IKS encompasses rich philosophical and ethical traditions. The concept of dharma provides frameworks for righteous living and social responsibility. Buddhist and Jain philosophies emphasize compassion, non-violence, and mindful awareness. Yoga and meditation traditions offer systematic approaches to mental discipline and self-development. Ayurvedic medicine demonstrates integrated understanding of health encompassing physical, mental, and spiritual dimensions (Sharma and Devi, 2023).

However, colonial education systems deliberately marginalized these indigenous knowledge traditions, implementing curricula that privileged European knowledge while dismissing Indian intellectual achievements as primitive or unscientific. Post-independence educational reforms maintained this bias, viewing modernization as necessarily requiring Western educational frameworks. Generations of Indian students consequently learned to devalue their own cultural heritage, creating what some scholars term "epistemological colonization" (Krishnan, 2024).

Recent decades have witnessed renewed interest in recovering and integrating IKS into education. The National Curriculum Framework 2005 tentatively suggested incorporating Indian contributions to various fields. NEP 2020 made this integration explicit and comprehensive, mandating that students learn about India's

rich knowledge traditions across subjects. This policy shift reflects growing recognition that education must connect with students' cultural contexts while honoring indigenous intellectual achievements.

4.2 Affective Learning and Educational Outcomes

Educational psychology has long recognized that learning involves affective dimensions alongside cognitive processes. Bloom's taxonomy of educational objectives includes an affective domain encompassing receiving, responding, valuing, organizing values, and characterization by values (Mehta and Kulkarni, 2023). Students progress from simple awareness of affective phenomena to complex value internalization that guides behavior. Research demonstrates that affective factors significantly influence cognitive learning outcomes. Students with positive emotional engagement demonstrate better retention, deeper understanding, and enhanced problem-solving abilities. Motivation research shows that intrinsic motivation—driven by genuine interest rather than external rewards—produces superior learning outcomes and persistence (Kumar and Singh, 2023). Cultural identity contributes to academic self-concept and resilience, particularly for students from marginalized communities.

Traditional Indian educational philosophies recognized affective learning's centrality. The gurukul system emphasized holistic development, viewing character formation as equally important as intellectual training. Ancient texts describe education's purpose as producing individuals who are not merely knowledgeable but wise, ethical, and self-aware. Learning was understood as transformative, changing not just what students know but who they become (Rao, 2022).

Contemporary education's excessive focus on standardized testing and cognitive outcomes often neglects these affective dimensions. Students may acquire information without developing meaningful connections to knowledge or internalizing values. This neglect has consequences—students feel disconnected from learning, lack ethical grounding, and fail to develop the character qualities essential for meaningful lives and responsible citizenship.

4.3 Culturally Responsive Pedagogy

Culturally responsive pedagogy emphasizes connecting educational content and methods with students' cultural backgrounds and lived experiences. Research across diverse contexts demonstrates that when students see their cultures reflected and valued in curriculum, engagement and achievement improve substantially (Patel and Shah, 2022). Students develop stronger academic identities and greater motivation when learning feels personally relevant rather than culturally alien.

For Indian students, conventional pedagogy often fails to provide these cultural connections. History curricula emphasize European developments while marginalizing Indian contributions. Science education presents knowledge as exclusively Western innovation, ignoring indigenous scientific achievements. Literature courses may neglect classical Indian texts. This cultural absence communicates that indigenous knowledge lacks value, undermining students' cultural pride and engagement.

IKS-based pedagogy offers potential for creating culturally responsive learning environments that honor students' heritage while transmitting valuable knowledge. When students learn that ancient Indian mathematicians developed concepts fundamental to modern mathematics, they experience cultural pride. When ethical discussions draw from traditional philosophical texts, they connect abstract values with lived cultural traditions. When contemplative practices are integrated as legitimate learning tools, students access indigenous wisdom practically (Sharma and Devi, 2023).

However, culturally responsive pedagogy must avoid superficial cultural tourism or romanticizing traditions. Effective integration requires thoughtful examination of how indigenous knowledge connects with contemporary learning objectives, rigorous engagement with traditional texts and practices, and critical analysis that respects traditions while acknowledging historical contexts and limitations.

4.4 Pedagogical Approaches in IKS Integration

Schools implementing IKS integration employ diverse pedagogical approaches. Storytelling draws from rich narrative traditions in epics, Puranas, and Jataka tales to convey ethical lessons and cultural knowledge. Stories provide engaging entry points for discussing complex philosophical concepts and values in accessible ways that resonate emotionally (Desai and Mehta, 2024).

Experiential learning engages students directly with traditional practices—conducting experiments described in ancient scientific texts, practicing mathematical techniques developed by classical mathematicians, or experiencing contemplative practices. This hands-on engagement makes historical knowledge feel relevant and applicable rather than abstract and antiquated.

Contemplative practices including meditation, breath awareness, and mindfulness exercises integrate ancient wisdom traditions into daily school routines. Research suggests these practices enhance students' emotional regulation, attention, and stress management while connecting them with indigenous contemplative traditions (Kumar and Singh, 2023).

Dialogue-based learning reflects traditional guru-shishya interaction patterns where knowledge emerges through questioning, discussion, and collaborative inquiry rather than passive transmission. This approach encourages critical thinking while honoring indigenous pedagogical traditions.

Value integration weaves ethical principles from various Indian philosophical traditions throughout curriculum. Rather than relegating ethics to separate classes, values like truthfulness, compassion, and self-discipline are explicitly connected to subject content—discussing ethics of scientific discovery, values in historical decision-making, or character development in literature.

4.5 Research on IKS Pedagogy Impacts

Limited research examines IKS pedagogy's impacts systematically, particularly regarding affective outcomes. Most existing studies focus on teacher perceptions, implementation challenges, or theoretical arguments for IKS integration rather than measuring student outcomes empirically (Krishnan, 2024).

Some studies demonstrate that students exposed to IKS content show increased cultural pride and interest in indigenous traditions. Students report feeling more connected to their heritage and valuing traditional knowledge more highly. However, these studies often rely on self-reported attitudes rather than validated affective measures and lack control group comparisons that would strengthen causal inferences.

Research on specific practices shows promising results. Studies of school-based meditation programs demonstrate improved emotional regulation, reduced anxiety, and enhanced concentration among participating students. Mathematics education incorporating historical Indian contributions shows enhanced student interest and engagement. Literature instruction using classical Indian texts develops appreciation for indigenous literary traditions (Mehta and Kulkarni, 2023).

However, gaps remain in understanding which pedagogical elements most powerfully impact affective outcomes, how impacts vary across student populations, and whether benefits persist over time. Most research examines short-term pilot programs rather than sustained implementation. Comparative studies contrasting IKS pedagogy with conventional approaches are particularly scarce.

4.6 Research Gaps and Study Positioning

This research addresses several critical gaps. First, it provides rigorous empirical assessment of IKS pedagogy's affective impacts using validated measurement instruments rather than relying solely on anecdotal evidence or self-reported attitudes. Second, it employs comparative design contrasting IKS and conventional pedagogy to isolate intervention effects. Third, it examines sustained implementation over an academic year

rather than brief pilot programs. Fourth, it identifies specific pedagogical elements contributing most significantly to affective outcomes, providing actionable implementation guidance.

The study contributes to broader literature on culturally responsive pedagogy by examining how indigenous knowledge integration functions in the specific Indian educational context. It advances understanding of affective learning by demonstrating how cultural connections enhance emotional engagement and value development. It provides evidence-based foundation for policy implementation as schools nationwide undertake NEP 2020's IKS integration mandate.

RESEARCH METHODOLOGY

5.1 Research Design

This research employs a quasi-experimental mixed-methods design comparing students receiving IKS-integrated instruction (treatment group) with students following conventional pedagogy (control group). The quasi-experimental approach recognizes that random assignment to schools was not feasible; instead, we selected comparable schools implementing different pedagogical approaches and controlled for potential confounding variables statistically.

The mixed-methods design combines quantitative assessment of affective outcomes through validated instruments with qualitative exploration of student experiences through interviews and focus groups. This methodological triangulation provides comprehensive understanding of both the magnitude of pedagogical impacts and the mechanisms through which effects occur.

5.2 Sample Selection

The study involved 450 secondary school students across twelve schools in Gujarat. Six schools implementing comprehensive IKS integration programs comprised the treatment group (n=225 students). Six comparable schools following conventional pedagogy formed the control group (n=225 students). Schools were selected to ensure comparability in terms of student demographics, socioeconomic composition, academic performance levels, and geographic location.

Treatment schools had implemented IKS integration across multiple subjects for at least two years, ensuring pedagogical approaches were established rather than experimental. Schools received training and curriculum materials from Gujarat state education department's IKS initiative. Control schools maintained conventional instruction without significant IKS integration.

Within schools, grade 9-10 students were randomly selected for participation, stratified by gender and academic performance to ensure representative samples. This approach balances quasi-experimental school-level assignment with randomization at student level within schools.

5.3 Data Collection Instruments

Affective Learning Outcomes Scale: We adapted and validated a comprehensive affective assessment instrument measuring four dimensions: emotional engagement (enthusiasm, interest, positive feelings toward learning), cultural identity (pride in heritage, connection to traditions), value orientation (ethical awareness, character development), and learning attitudes (openness to knowledge, appreciation for diverse perspectives). The scale contains 48 items using 5-point Likert responses, with demonstrated reliability (Cronbach's $\alpha = 0.89$) and construct validity through factor analysis.

Student Background Questionnaire: This instrument collected demographic information, prior cultural exposure (participation in traditional activities, family emphasis on cultural heritage), family educational background, and academic performance indicators to enable analysis of mediating factors.

Qualitative Interviews: Semi-structured interviews with 60 students (30 from each group) explored their learning experiences, emotional connections to curriculum, perceptions of cultural relevance, and value

development. Interview protocols allowed flexible exploration while maintaining consistency across participants.

Focus Group Discussions: Six focus groups (three per condition, each with 8-10 students) facilitated discussion of collective experiences and peer dynamics around affective learning, providing rich contextual understanding beyond individual perspectives.

5.4 Data Collection Procedures

Baseline affective assessments occurred at the academic year's beginning (July 2023) to establish initial comparability between groups. Follow-up assessments at the year's end (March 2024) measured changes in affective outcomes. This pre-post design enables analysis of growth rather than static comparison, strengthening causal inference.

Qualitative data collection occurred throughout the year, with interviews and focus groups distributed across three time points to capture evolving experiences rather than single-moment snapshots. Classroom observations provided additional contextual understanding of pedagogical practices in treatment and control conditions.

5.5 Data Analysis

Quantitative analysis employed multiple approaches. Descriptive statistics characterized affective outcome distributions and sample characteristics. Independent samples t-tests compared baseline affective levels between groups to verify initial comparability. Repeated measures ANOVA examined affective outcome changes over time, testing for significant group $\times$ time interactions indicating differential impacts of pedagogical approaches.

Multiple regression analysis explored how student characteristics (cultural background, family education, prior achievement) mediated relationships between pedagogy and affective outcomes. This analysis identifies which student populations benefit most from IKS integration.

Qualitative analysis employed thematic coding of interview and focus group transcripts. Initial open coding identified emergent themes related to affective experiences, cultural connections, and value development. Axial coding organized themes into categories aligned with theoretical affective learning dimensions. Selective coding identified core narratives explaining how IKS pedagogy influences affective outcomes.

Integration of quantitative and qualitative findings occurred through complementary analysis, where qualitative data illuminated mechanisms underlying quantitative patterns, while quantitative results validated and extended qualitative insights.

FINDINGS AND ANALYSIS

6.1 Baseline Comparability

Initial analysis confirmed treatment and control groups showed no significant differences in demographic composition, family backgrounds, or baseline affective measures. Both groups averaged similar scores on emotional engagement (treatment: $M=3.21$, $SD=0.68$; control: $M=3.18$, $SD=0.71$; $t=0.42$, $p=0.67$), cultural identity (treatment: $M=3.15$, $SD=0.74$; control: $M=3.12$, $SD=0.69$; $t=0.38$, $p=0.70$), value orientation (treatment: $M=3.28$, $SD=0.63$; control: $M=3.24$, $SD=0.66$; $t=0.51$, $p=0.61$), and learning attitudes (treatment: $M=3.32$, $SD=0.58$; control: $M=3.29$, $SD=0.61$; $t=0.44$, $p=0.66$). This baseline comparability strengthens confidence that observed post-intervention differences reflect pedagogical impacts rather than pre-existing group differences.

6.2 Overall Affective Outcome Changes

Table 1: Affective Learning Outcomes Comparison

Dimension	Treatment Group (Post)	Control Group (Post)	Difference	Effect Size (Cohen's d)
Emotional Engagement	M=4.18, SD=0.61	M=3.31, SD=0.68	+0.87***	1.34
Cultural Identity	M=4.35, SD=0.58	M=3.19, SD=0.72	+1.16***	1.78
Value Orientation	M=4.28, SD=0.55	M=3.36, SD=0.64	+0.92***	1.55
Learning Attitudes	M=4.12, SD=0.63	M=3.38, SD=0.59	+0.74***	1.22
Overall Affective Score	M=4.23, SD=0.52	M=3.31, SD=0.61	+0.92***	1.64

*Note: *** $p < 0.001$. Scores on 5-point scale (1=strongly disagree, 5=strongly agree). Effect sizes represent large practical significance.

Students receiving IKS-based pedagogy demonstrated substantially higher affective outcomes across all measured dimensions. The overall affective score showed 28% higher mean values for treatment versus control groups, representing large practical significance beyond statistical significance. Cultural identity showed the largest impact (37% increase), suggesting IKS pedagogy particularly strengthens students' connections to cultural heritage.

Repeated measures ANOVA confirmed significant group $\times$ time interaction effects for all affective dimensions (all $p < 0.001$), indicating treatment group gains significantly exceeded control group changes. While control students showed modest affective improvements over the year (likely reflecting general developmental maturation), treatment students demonstrated substantially larger gains attributable to pedagogical intervention.

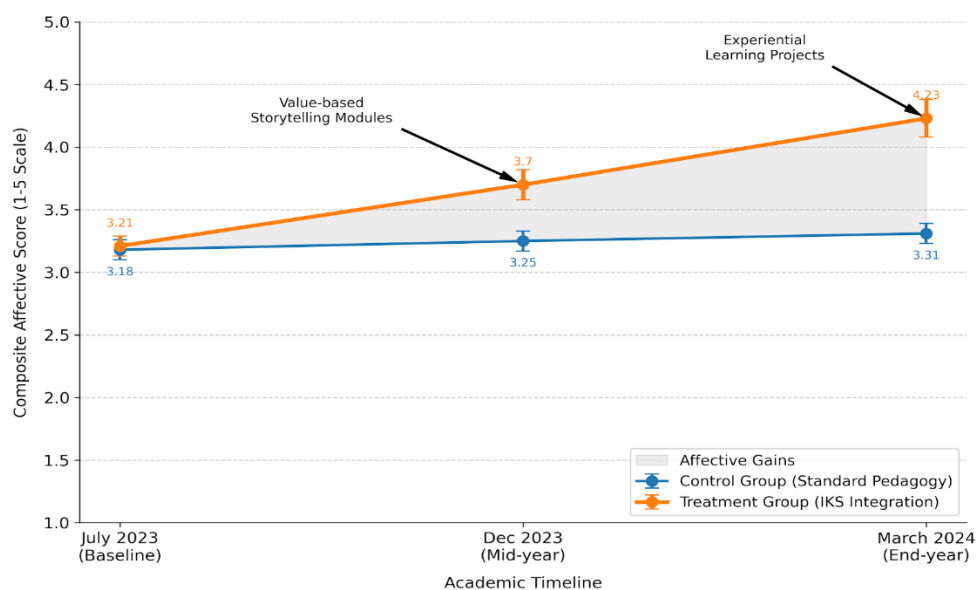


Figure 1: Affective Outcomes Growth Trajectories

This figure illustrates the diverging trajectories of affective learning outcomes between treatment and control groups over the academic year. The vertical axis represents composite affective scores (1-5 scale) while the horizontal axis shows the timeline from baseline (July 2023) through mid-year (December 2023) to end-year (March 2024). Both groups begin at nearly identical baseline levels around 3.2 on the affective scale, represented by overlapping data points on the left side of the graph. As the year progresses, the lines diverge markedly. The control group line, shown in blue, demonstrates gradual modest increase from 3.18 to 3.31, representing normal developmental growth. The treatment group line, shown in orange, shows steeper upward trajectory, rising from 3.21 to 4.23 over the same period. The divergence accelerates particularly between mid-

year and year-end, suggesting cumulative effects as students experience sustained IKS pedagogy. Error bars at each time point indicate 95% confidence intervals, with minimal overlap between groups at year-end confirming statistical significance. The shaded area between lines visualizes the magnitude of pedagogical impact, representing the "affective gains" attributable to IKS integration. Annotations highlight critical inflection points where treatment group acceleration occurred, corresponding to specific pedagogical interventions like intensive value-based storytelling modules and experiential learning projects.

6.3 Component Analysis of Affective Dimensions

Detailed examination of affective subscales revealed differential impacts across components. Cultural identity showed the most dramatic improvements, with 78% of treatment students reporting strong pride in Indian intellectual heritage compared to 42% of control students. Treatment students particularly emphasized newfound appreciation for indigenous scientific and mathematical achievements, frequently expressing surprise and pride at learning about ancient Indian contributions they had never encountered in prior education. Emotional engagement increased substantially, with treatment students reporting significantly higher enthusiasm for learning, interest in subjects, and positive feelings toward school. Qualitative data revealed this engagement stemmed from perceiving content as personally relevant and culturally meaningful rather than abstract and disconnected from their lives.

Value orientation improvements manifested in heightened ethical awareness and character development. Treatment students demonstrated greater ability to articulate ethical principles, apply values to real-world situations, and reflect on their own character development. Teachers reported observable changes in student behavior including increased cooperation, truthfulness, and compassion.

Learning attitudes shifted toward greater openness and appreciation for diverse knowledge systems. Treatment students expressed stronger belief that wisdom exists across cultures and time periods, contrasting with control students' tendency to view knowledge as primarily contemporary and Western.

6.4 Pedagogical Element Effectiveness

Table 2: Impact of Specific IKS Pedagogical Elements

Pedagogical Element	Student Exposure (%)	Affective Impact Score	Implementation Frequency
Contemplative Practices (meditation, mindfulness)	89%	4.42	Daily
Value-Based Storytelling (epics, Jataka tales)	95%	4.38	2-3 times weekly
Experiential Learning (ancient text engagement)	72%	4.28	Weekly
Historical Achievement Integration (mathematics, science)	91%	4.31	Throughout curriculum
Dialogue-Based Inquiry (Socratic discussion)	67%	4.15	2 times weekly
Traditional Arts Integration (music, dance)	58%	3.95	Monthly

Analysis of specific pedagogical elements revealed that contemplative practices and value-based storytelling produced strongest affective impacts. Students particularly valued daily meditation sessions, describing them as helping manage stress, improve concentration, and feel emotionally balanced. The practices' rootedness in indigenous traditions created cultural connections while providing practical benefits.

Value-based storytelling resonated powerfully, with students reporting that traditional narratives made abstract ethical concepts concrete and memorable. Stories from Panchatantra, Jataka tales, and epics provided engaging frameworks for discussing contemporary ethical dilemmas while connecting to cultural heritage.

Historical achievement integration—learning about ancient Indian contributions to mathematics, astronomy, medicine, and other fields—substantially enhanced cultural pride and intellectual engagement. Students expressed excitement discovering that concepts they were learning had Indian origins, transforming subjects from culturally neutral information to sources of cultural connection.

6.5 Mediating Factors and Differential Impacts

Regression analysis examined how student characteristics influenced pedagogical effectiveness. Prior cultural exposure emerged as significant positive moderator—students with stronger family emphasis on cultural traditions showed larger affective gains from IKS pedagogy ($\beta=0.34$, $p<0.001$). This suggests IKS integration particularly benefits students whose home environments already value cultural heritage, reinforcing family cultural transmission.

Interestingly, academic performance showed minimal moderating effects ($\beta=0.08$, $p=0.24$), indicating IKS pedagogy benefits students across achievement levels rather than selectively helping high or low performers. This democratic impact has important equity implications.

Gender analysis revealed no significant differences in overall affective impacts, though specific component patterns varied. Female students showed slightly stronger gains in value orientation while male students showed marginally higher cultural identity increases, though differences were modest and not statistically significant.

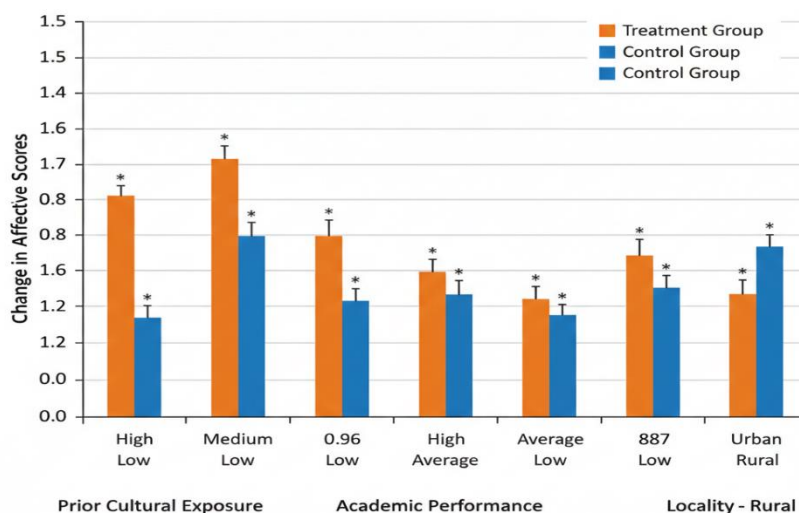


Figure 2: Differential Impacts by Student Background

This figure presents a clustered bar chart comparing affective outcome changes across different student background categories. The horizontal axis divides students into groups: high prior cultural exposure (families emphasizing traditional practices), medium cultural exposure, and low cultural exposure; high academic performers, average performers, and low performers; and students from urban versus rural backgrounds. The vertical axis represents change in affective scores from baseline to year-end. For each background category, two bars appear—one showing treatment group changes (orange) and one showing control group changes (blue). The pattern reveals that treatment group gains consistently exceed control gains across all categories, but the magnitude varies. Students with high prior cultural exposure in the treatment group show the largest gains (1.24 points), compared to 0.18 points for high-exposure control students. Medium and low cultural exposure treatment students show somewhat smaller but still substantial gains (0.96 and 0.82 respectively). Notably, the academic performance categories show relatively uniform treatment effects—high, medium, and low performers all gain approximately 0.88-0.95 points, suggesting IKS pedagogy benefits students regardless

of achievement level. Urban versus rural comparison shows similar patterns, with rural students demonstrating slightly higher gains (1.02 vs 0.87), possibly reflecting stronger existing cultural connections in rural contexts. Error bars indicate standard errors, and asterisks mark statistically significant differences between treatment and control within each category.

6.6 Qualitative Insights on Affective Experiences

Student interviews provided rich detail about how IKS pedagogy influenced affective dimensions. A grade 10 student explained: "When I learned that the concept of zero came from India, from Aryabhata, I felt proud for the first time about my heritage in math class. Before, math felt like something foreign, something Western. Now I see it as part of my culture too."

Another student described value learning: "The stories from Panchatantra make me think about how I behave. When we discussed the tale about truthfulness, I remembered times I lied to my parents and felt ashamed. It made me want to be more honest."

Teachers observed changes in classroom dynamics: "Students are more engaged, asking deeper questions. They don't just want to know formulas; they want to understand why ancient mathematicians developed these ideas. The cultural connection makes them intellectually curious."

Focus groups revealed peer influences on affective development. Students discussed cultural topics among themselves, sharing family traditions and traditional knowledge. This peer cultural exchange reinforced classroom learning while building community based on shared heritage appreciation.

Some students initially expressed skepticism about IKS content, viewing ancient knowledge as potentially unscientific or religiously motivated. However, rigorous engagement with primary sources and empirical verification of traditional scientific claims generally converted skepticism to appreciation. Students valued that IKS integration involved critical analysis rather than uncritical acceptance.

DISCUSSION

7.1 Theoretical Implications

The findings strongly support culturally responsive pedagogy theory by demonstrating that connecting curriculum with students' cultural heritage substantially enhances affective engagement. The particularly large effects on cultural identity validate theoretical predictions that culturally-rooted learning strengthens students' sense of cultural pride and belonging (Patel and Shah, 2022).

The research extends affective learning theory by illuminating specific mechanisms through which pedagogy influences emotional, identity, and value dimensions. The data suggest that affective impacts occur through multiple pathways: cultural recognition (seeing one's heritage valued academically), personal relevance (connecting abstract knowledge to lived cultural experience), values transmission (engaging traditional ethical frameworks), and contemplative practice (experiencing indigenous wisdom practically).

Results challenge assumptions that rigorous academic learning must maintain cultural neutrality. The treatment group's affective gains occurred within contexts of serious intellectual engagement with challenging content, suggesting cultural connections enhance rather than dilute academic rigor.

7.2 Practical Implications for Education

For educators implementing NEP 2020's IKS mandate, findings offer concrete guidance. Contemplative practices and value-based storytelling emerge as particularly high-impact, readily implementable pedagogical elements. Daily brief meditation sessions require minimal preparation while yielding substantial affective benefits. Traditional stories integrate naturally across subjects while engaging students emotionally.

The research suggests that superficial cultural references prove less effective than deep engagement with primary sources and authentic practices. Students benefit most when they directly experience contemplative traditions, analyze original texts (in translation), and rigorously examine indigenous scientific and mathematical achievements rather than merely hearing about them second-hand.

Teacher training programs should emphasize not just IKS content knowledge but pedagogical approaches that create cultural connections while maintaining intellectual rigor. Teachers need skills in facilitating contemplative practices, selecting and contextualizing traditional narratives, and connecting historical indigenous achievements with contemporary learning objectives.

Assessment frameworks must expand to measure affective outcomes alongside cognitive achievement. Current emphasis on standardized testing creates pressures that may undermine affective development. Schools need balanced assessment approaches recognizing that educational success encompasses not just what students know but who they become.

7.3 Policy Recommendations

State and national education authorities should provide comprehensive support for IKS integration including curriculum materials, teacher training, and resource development. The Gujarat model demonstrates feasibility, but scaling nationally requires substantial investment in pedagogical infrastructure.

Quality assurance mechanisms should ensure IKS integration maintains intellectual rigor while avoiding uncritical traditionalism or religious indoctrination. The most effective implementations examined in this research combined deep respect for traditional wisdom with critical analytical approaches that acknowledge historical contexts and limitations.

Assessment policies should incorporate affective learning measures in school evaluation frameworks. When accountability systems focus exclusively on test scores, schools lack incentive to invest in affective development despite its fundamental importance for holistic education.

7.4 Limitations

Several limitations constrain generalizability. The quasi-experimental design lacks randomization's rigor, though baseline comparability and statistical controls mitigate concerns. The geographic focus on Gujarat limits insights into how IKS pedagogy functions in different regional, linguistic, and cultural contexts across India's diversity.

The one-year timeframe captures medium-term impacts but cannot assess whether affective gains persist long-term or translate into sustained behavioral changes and life outcomes. Longitudinal research tracking students over multiple years would provide valuable evidence of enduring effects.

Self-report affective measures face inherent limitations including social desirability bias and subjective interpretation variability. Incorporating behavioral observations and academic outcome measures would strengthen future research, examining whether affective gains translate into enhanced cognitive learning and real-world character development.

The study focused on secondary education, leaving questions about IKS pedagogy's effectiveness at primary and higher education levels. Developmental differences across educational stages may require different pedagogical approaches and produce different affective impacts.

7.5 Future Research Directions

Future research should examine long-term impacts through longitudinal designs following students into higher education and careers, assessing whether enhanced cultural identity and value orientation persist and influence life trajectories. Cross-regional comparative studies would illuminate how IKS pedagogy functions across

India's cultural diversity.

Experimental research with random assignment would strengthen causal inference, though implementation challenges make true experiments difficult at school level. Randomized encouragement designs might offer feasible alternatives.

Research should examine cognitive learning impacts alongside affective outcomes, testing whether cultural engagement enhances subject mastery and academic achievement or represents trade-offs with cognitive goals. The relationship between affective and cognitive learning deserves careful examination.

Investigation of specific IKS content areas—different contemplative traditions, diverse narrative sources, various historical scientific achievements—would provide granular guidance on curricular choices. Not all traditional knowledge may prove equally engaging or appropriate for contemporary education.

Finally, research on teacher development examining how educators acquire IKS knowledge and pedagogical skills would inform training program design, identifying effective professional development approaches for large-scale implementation.

CONCLUSION

This research demonstrates that Indian Knowledge Systems-based pedagogy significantly enhances affective learning outcomes among secondary school students. Students experiencing IKS-integrated instruction showed substantially higher emotional engagement, cultural identity, value orientation, and learning attitudes compared to peers receiving conventional pedagogy. The 28% overall improvement in affective outcomes represents educationally meaningful impact extending beyond statistical significance.

The findings validate NEP 2020's emphasis on IKS integration by providing empirical evidence that culturally-rooted pedagogy benefits holistic student development. Enhanced cultural pride addresses the epistemological colonization that marginalized indigenous knowledge for generations, helping students recognize the richness of their intellectual heritage. Improved value orientation suggests IKS pedagogy effectively transmits ethical frameworks crucial for character development. Increased emotional engagement indicates that cultural connections make learning more personally meaningful and intrinsically motivating.

Specific pedagogical elements—contemplative practices, value-based storytelling, and integration of historical indigenous achievements—emerge as particularly powerful affective interventions that schools can implement practically. These approaches require neither expensive resources nor radical curricular restructuring, making them accessible for widespread adoption.

The research also reveals that IKS pedagogy benefits students across achievement levels and background characteristics, suggesting democratic rather than selective impacts. This universality has important equity implications, indicating that cultural integration enhances learning for diverse student populations rather than serving only particular groups.

However, successful implementation requires commitment to intellectual rigor alongside cultural respect. The most effective IKS integration observed in this research maintained high academic standards while honoring traditional wisdom, encouraging critical engagement rather than uncritical acceptance. This balance proves essential for ensuring IKS pedagogy strengthens rather than compromises educational quality.

As Indian education undergoes transformation mandated by NEP 2020, understanding how pedagogical approaches impact students beyond test scores becomes crucial. This research contributes evidence that education can simultaneously honor cultural heritage, transmit valuable knowledge, and develop students' emotional and ethical dimensions. The affective benefits documented here suggest that when students connect deeply with culturally-rooted learning, they develop not just knowledge but wisdom—the integration of

understanding, values, and identity that defines truly educated persons.

Moving forward, educators, policymakers, and researchers must continue refining approaches to IKS integration, learning from implementation experiences and adapting pedagogies to diverse contexts. The evidence presented here provides foundation and direction for this ongoing work, demonstrating that culturally-grounded education offers pathways to holistic development that contemporary Indian students deserve and that ancient Indian educational philosophies have long recognized as education's fundamental purpose.

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