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Research Evidence on Multi-disciplinarity, Inter-disciplinarity, Trans-disciplinarity and the Indian Knowledge System: A Review

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ABSTRACT

The conjunction and unification in between multidisciplinarity research approaches and the Indian Knowledge System (IKS) is synthesized in the form contemporary research evidences. To address complex, real-world problems in health, agriculture, environment, and education, multi-disciplinarity plays a significant role in bringing different perspectives of multiple disciplines together. IKS provide knowledge derived from experience, observation, and experimentation which has been generated and collected from many centuries in the form of indigenous religious and cultural practices, in literatures (oral traditions, stories, and folklore), and other institutional practices (such as traditional medicine, sustainable agriculture, environmental management, craft skills, community laws, governance structures, beliefs, rituals, and social customs). The present systematic review or meta-analysis locates and evaluates studies that have combined IKS and modern disciplinary methods, identifies the methodological and epistemological challenges that arise in such integration, and proposes pragmatic frameworks and research designs for rigorous interdisciplinary inquiry. Priority wise key core and major strategic areas, considered in the present study include: health - where ayurveda and modern medicine link and affiliates in the form of clinical trials and pharmacological studies; empirically evaluated sustainable agriculture traditional practices like crop diversity, natural farming, indigenous water management; Vedic and classical mathematical procedures and observational astronomy which crossroads IKS with Science, Technology, Engineering, Mathematics (STEM) with translational research implications; and finally promotion of IKS in all stages of school as well as in higher education which can be achieved via pedagogy and curricular reforms as per the National Education Policy 2020 (NEP-2020). The present review study gives importance to protocols which are evidence-based, community led development of knowledge, and role of domain experts, social and arts-aesthetic scientists and finally methodologists in bridging the gaps of IKS with authenticity. Mismatch in standards, incomplete and improper documentation and ethical concerns are some of the main issues and stumbling blocks which are dealt in the present study with specific actions, practical measures, and tangible steps to mitigate the same while maintaining and preserving cultural heritage and ethnic integrity. Present study culminates and reckons that with the help of meticulous, precise, and scientific stringency and native epistemic multi-disciplinary studies and research, can expand knowledge frontiers and produce socially relevant innovations; however, success requires methodological reflexivity, transparent reporting, and capacity-building at institutional levels.

Keywords: NEP 2020, Indian Knowledge System, Multi-disciplinary research, Epistemic, Triangulation, Ayurveda, STEM, Key Performance Indicators

Climate resilience, chronic disease, biodiversity loss, sustainable food systems and culturally relevant education are some of the complex societal challenges which demand solutions that

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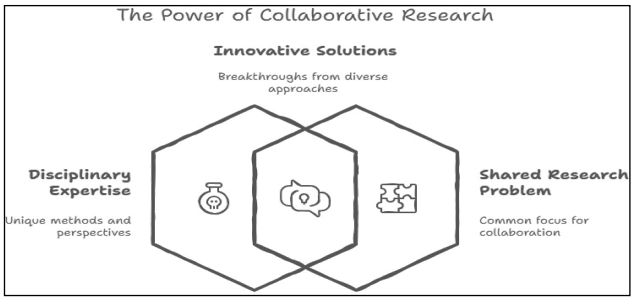
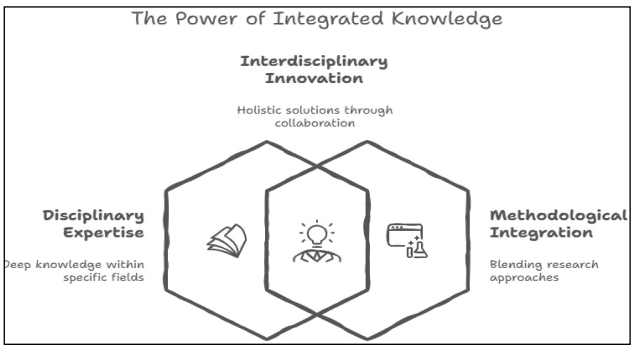
transcend single-discipline boundaries. Whereas, multifaceted problems can be better dealt with the help of multidisciplinary studies and research which integrates diverse disciplinary tools, methods, and perspectives to tackle multifaceted problems, and recent meta-analyses and practical case studies show measurable benefits in outcomes and innovation (Nguyen, *et al.* 2022; Brown, 2023). India is a nation with deep scholarly traditions, possessing extensive indigenous repositories of traditional, cultural practices and effective practical knowledge which is collectively called as the Indian Knowledge System (IKS). IKS span agriculture, medicine, mathematics, architecture, astronomy and astrology, metallurgy and many more. National Education Policy - 2020 (NEP - 2020) of India highlights the important pedagogic and valuable research of IKS and recommends initiatives for its scientific incorporation into curricula at all the levels of education in India i.e. school as well as higher education (https://www.education.gov.in/en/nep/indian-knowledge-systems). This manuscript integrates and consolidates research manifestations at the convergence of multidisciplinary research and IKS, evaluates systematic methodological approaches, presents illustrative examples, and offers a research agenda to ethically and rigorously integrate IKS into modern research ecosystems in India (Nguyen, *et al.* 2022; Brown, 2023; https://www.education.gov.in/en/nep/indian-knowledge-systems).

Conceptual framing: Multi-disciplinarity, Inter-disciplinarity, Trans-disciplinarity and the IKS

Multidisciplinarity is often used interchangeably (but not identically) with interdisciplinary and transdisciplinary research. In the present paper, *multidisciplinarity* (Fig. 1(a)) denotes collaborative work in which researchers from multiple disciplines address a common problem while retaining disciplinary methods; *interdisciplinarity* (Fig. 1(b)) emphasizes methodological integration; and *trans-disciplinarity* (Fig. 1(c)) extends beyond academic level which includes all stakeholders and native indigenous knowledge custodians. IKS refers to indigenous intellectual traditions of the Indian subcontinent which may be in any of the form like textual, oral, material, monumental, practice and ritual based knowledge that evolved through observations, iterations, and pragmatic validation of the same. Integrating IKS with modern science is neither straightforward nor unidirectional but it requires intellectual modesty, designing of research questions collaboratively, and methodological diversity, multimethodology, mixed methods research, and triangulation.



(a)



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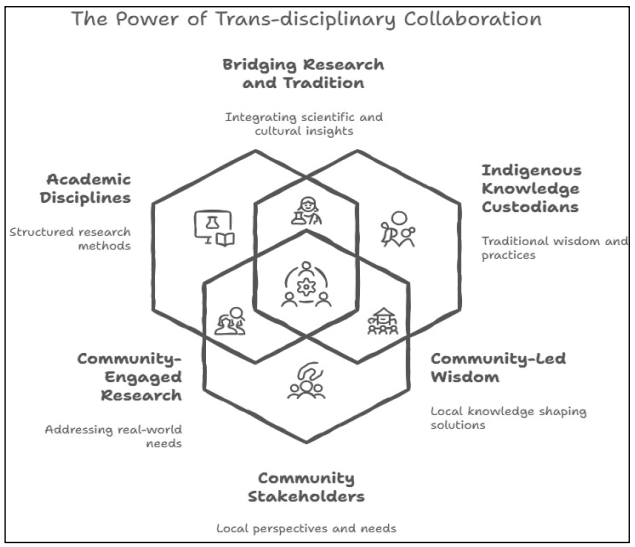

(c)

Fig. 1: Conceptual Framework **(a)** Multidisciplinarity **(b)** Interdisciplinarity and **(c)** Trans-Disciplinarity

Evidence that Multidisciplinary Approaches Improve Outcomes

A growing literature demonstrates that multidisciplinary teams achieve superior progressive problem framing, better combination of approaches, more practical and actionable solutions in health, design, and environmental domains. Scientific collaboration identifies principles for success, collaborative research, inter-disciplinary research, multi-disciplinary research, and trans-disciplinary research and further shared conceptual frameworks, mutual respect for methods, and mechanisms for synthesis (Brown, 2023). Literature review and evidence-based research synthesis of collaborative design and health research show improved innovation metrics and, in many cases, measurable improvements in patient-reported outcomes and program effectiveness when multiple disciplines collaborate closely (Nguyen, *et al.* 2022; Banerjee, *et al.* 2024). These findings justify the proposition that IKS problems which are often context-specific, situational, conditional, circumstance-driven, and socio-ecological and are complex, are well suited to multidisciplinary inquiry that combines modern experimental designs with ethnographic, literary, experiential approaches, hands-on techniques, and practical methods.[1], [2], [4]

Indian Knowledge System: Scope and Governmental Initiatives

The NEP-2020 and subsequent Ministry of Education (MoE) initiatives have made IKS an institutional goal, strategic focus, core objective, organizational aim, and mandate, issuing guidelines for including IKS credits in school as well as higher education, establishing IKS centres, and further supporting and promoting faculty training and documentation (https://www.education.gov.in/en/nep/indian-knowledge-systems). These critical steps through policy framework create infrastructure and incentives for multidisciplinary research possibilities connecting and coupling IKS and present-day Science, Technology, Engineering, Mathematics (STEM). The IKS mandate includes domains such as Ayurveda, Vedic and classical science and mathematics, indigenous agriculture and environment practices, water management, architecture, performing arts, astronomy and astrology, and language traditions which are all progressive rationale for fertile foundations of collaborative research (https://www.education.gov.in/en/nep/indian-knowledge-systems).

Domains of Empirical Convergence

Health: Ayurveda and biomedical research

The Ayurveda and modern medicine assimilation and blend have been one of the most visible domains of multidisciplinary work. Historical and contemporary studies range from basic pharmacognosy to randomized controlled trials (RCTs) of Ayurvedic formulations and relative equivalent effective research. Reviews and critical appraisals indicate promising leads (e.g., particular herbals or multi-component formulations) but also underline variable methodological quality across studies like small sample sizes, heterogeneity in formulations, and limited blinding among common issues (Chopra, *et al.* 2010; Morandi, *et al.* 2011). Recent institutional efforts emphasize standardized formulations, Good Clinical Practice (GCP) adherence, and mechanistic preclinical work (e.g., pharmacology, toxicology, omics etc.) as essential complements to clinical trials. Multi-disciplinary teams consisting of Ayurvedic scholars, pharmacologists, clinicians, and biostatisticians and their collaborations have produced the most acceptable viable and reliable strongest evidences.[5]

Agriculture and environmental management

IKS contains rich agro-ecological knowledge which includes crop rotation, seed selection, water harvesting (ancient step-wells and tank systems), composting, and natural pest management. Pragmatic experimental practical studies investigating traditional practices (e.g., seed diversity, community-managed water systems, and natural farming) show promising sustainability indicators and ecological benchmarks in the arenas of soil health, biodiversity, lower input dependence and climate resilience potential when compared with monocultural, high-input systems (Kumar, 2024). Multidisciplinary research that pairs agronomy, soil science, ecology, and socio-economics enables robust strong assessment and scalable innovative transformations.

STEM and historical sciences

Dedicated studies and research on classical Indian science and mathematics and astronomy have revealed trailblazing revolutionary enumerative quantitative analytical techniques and observational records that may enrich historical epistemology and even inspire modern computational algorithms. Project work combining philology - the humanistic study of language and literature with changing grammar, sounds and meaning with the time, history of science, mathematics, and computational analysis have explicated and throw light on the context and content of ancient practices and techniques. These are primarily archival and interpretative multidisciplinary endeavors that yield different kinds of evidence like textual concordance, manuscript dating, and comparative reconstructions which are complementary to experimental science.

Education, pedagogy, and curricular research

NEP 2020's major cites to include IKS in curricula at both school as well as higher education has prompted and catalyzed multi-disciplinary, trans-disciplinary, and interdisciplinary curriculum-development plans and created a blueprint, involving educationists, subject experts, linguists, and cultural practitioners. When the courses are critically framed based on validated facts and reality, evidences from pilot implementations showed improved learner engagement, contextual relevance, and cultural literacy (Kumar, 2024; https://www.education.gov.in/en/nep/indian-knowledge-systems).

Methodological Approaches for Rigorous IKS as Multi-Disciplinary, Inter-Disciplinary, and Trans-Disciplinary Research

Multi-disciplinary research studies with IKS components must balance the essence and spirit for indigenous epistemic forms with the methodological demands of modern contemporary science with right character. Ideation and conceptualization of the above can be achieved in following ways:

- **Co-production and participatory methods:** Enthusiastic participation and engagement of knowledge-holders as collaborators, participants, and active research partners (co-investigators), not only as informants but as supervisors which will support ethical reciprocity and richer data (community validation of findings).
- **Protocol standardization and hybrid methods:** For domains like Ayurveda, establish SOPs for formulation, quality control, and Key Performance Indicators (KPIs), evaluation criteria, and output measures. Combine randomized or quasi-experimental designs with ethnographic process evaluation and mechanistic laboratory studies when and wherever appropriate.
- **Translational pipelines:** Map pathways from observational IKS claims → preclinical validation (chemistry, toxicology) → controlled clinical evaluation → implementation research which will allow initial emerging nascent potential claims and preliminary indications to be tested, examined, vetted, validated and evaluated and either rejected or translated into scalable procedures and mechanisms.
- **Epistemic pluralism with methodological rigor:** Recognize different kinds of evidences for IKS which can be a time-series, panel analysis, repeated measure design, cohort study, longitudinal practice-based validation, hypothesis-driven experiments, and mixed-methods social science assessments or a combination of the above. Further, make standards for recording and reporting systematically and transparently, which will help in interpreting results and outcomes by multiple audiences rationally.
- **Data documentation and digitization:** Systematic documentation of practices, local terminologies, roots and origins provenance is very important and critical approach in IKS studies and research. Digital conversion and transformation (with metadata) permit and validate the propagation with multiplicity for future systematic reviews and meta-analyses.

RESULTS AND DISCUSSION

Illustrative Case Studies

1. Ayurvedic formulations and chemotherapy cardio-protection (institutional reports) - Institutional work summarised by Ministry of

Ayush, Government of India initiatives as emerging institutional studies with baseline evidence reports on cardioprotective effects of certain herbo-mineral formulations when co-administered with chemotherapeutics in preclinical and early clinical settings; robust confirmation awaits large RCTs and transparent reporting of formulations, dosing, and endpoints (Chopra, *et al.* 2010; Ministry of AYUSH (MoA) 2023).

2. Natural farming and soil health pilots - Filed trials, comparative experimentation and comparative agronomic trials in several Indian states showed that diversified cropping and traditional composting practices and techniques has improved soil fertility by increasing organic carbon and thereby reducing the use of fertilizers over multi-year horizons (Kumar, 2024).

3. IKS in teacher education blueprint plans - Scheme pilot project for development of curricula integrating local crafts and artisans, oral histories, and Vedic science and mathematics, astronomy and astrology, traditional farming practices and natural farming have improved student engagement and local cultural literacy in initial assessments, though rigorous long-term impact evaluations are limited (Chopra, *et al.* 2010; Kumar, 2024; https://www.education.gov.in/en/nep/indian-knowledge-systems).

Challenges and Risks

1. Standards mismatch - With reference to IKS, differences in evidences, standards and terminologies create barriers in integrating it with the education and bridging the gap in between rich traditional intellectual heritage and contemporary educational approaches. IKS often gives importance to long-term empirical confirmation, experimental proof, observational verification, and substantiation through experiences and its experiential validation, whereas in contrast, contemporary science and other subjects prefer controlled and replicable trials.

2. Documentation gaps - Many traditional practices are orally transmitted or highly localized, complicating its replication and scaling.

3. Cultural appropriation and ethical risks - Studies and researches related to IKS must avoid approaches which are extractive in nature which means benefits and intellectual property must be justifiably and equitably credited and shared to the natives, and following the process and community consent must be prioritized at all the times.

4. Quality and reproducibility issues - Past research sometimes suffers from small samples, poor controls, and publication biases which raises issues related to validation and authenticity. Therefore, strengthening the methodology is very crucial and as well as essential for credibility.

5. Institutional inertia and incentives - In general, the academic reward systems often favour those publications which are discipline-specific. Multi-disciplinary, trans-disciplinary, inter-disciplinary and related research work, especially with indigenous and native collaborators to be considered and included which requires different timelines and evaluation metrics.

Recommendations

1. Establish multidisciplinary centres of excellence - Institutionalize IKS research hubs and IKS centres at various levels of educational strata that host zoologists, botanists, Ayurveda, Unani, Siddha, Homeopathy experts and clinicians, historians, social scientists, custodians and community representatives who will help in seed funding, standardized laboratories, and ethical oversight in establishing IKS concretely.

2. Standard operating frameworks - For domains like Ayurveda, create community-endorsed Standard Operating Procedures (SOPs) for plant authentication, formulation standardization, and outcome measurement.

3. Capacity-building - Train and orient researchers and prospective resource persons in IKS through fieldwork, participant observation, cultural immersion, and anthropological study and other ethnographic methods, community engagement, and translational science; likewise, offer induction and guidance programmes for IKS practitioners in basic research design.

4. Funding and publication incentives - Create dedicated grant lines and funding for IKS and publishing the multi-disciplinary, inter-disciplinary, and trans-disciplinary IKS studies and research work in high quality indexed journals that recognize the work globally with novel mixed-method evidences for the same.

5. Ethical and Intellectual Property (IP) frameworks - Collaborate, partner, work and create together, and develop jointly, the benefit-sharing agreement model and IP policy frameworks that recognize individual and community contributions of native people and protect traditional intellectual knowledge rights of practices encultured in various fields and subjects related to IKS.

CONCLUSION

Multi-disciplinary with inter-disciplinary, and trans-disciplinary studies and research work in context to the Indian Knowledge System and its integration, together present a promising, though challenging extremities for generating socially and scientifically relevant knowledge and innovations. The available evidence indicates that the research groups dedicated to multi-disciplinary, inter-disciplinary, and trans-disciplinary studies apply rigorous, transparent methods and engage knowledge-holders respectfully and significantly. IKS can contribute valuable empirical leads and context-sensitive solutions in various fields of study especially in health, agriculture, astronomy and astrology and education. However, systematic and exhaustive meticulous system of IKS, documentation standards, ethical frameworks, and institutional incentives are key important and essential parameters for fulfilment, achievement, lasting influence, and enduring results with sustained impact of IKS. Purposeful and planned diverse research agenda knitted methodologically which is rooted in cohering and amalgamation of IKS can build credible bridges between centuries of indigenous practices and contemporary disciplines, creating new knowledge that is both scientifically robust and culturally resonant.

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REFERENCES

Brown, S.A. 2023. *Team principles for successful interdisciplinary research*. *National Center for Biotechnology Information (NCBI)*. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10946054/

Nguyen, M. *et al.* 2022. A systematic review of empirical studies on multidisciplinary design collaboration. *Journal of Design Research*, (See ScienceDirect overview: https://www.sciencedirect.com/science/article/pii/S0142694X22000400)

Ministry of Education, 2023 Government of India. *Indian Knowledge Systems* (Thematic session / NEP resources). https://www.education.gov.in/en/nep/indian-knowledge-systems

Banerjee, A. *et al.* 2024. Research across multiple disciplines to respond to health challenges. *BMJ*, 387: bmj-2023-078445. https://www.bmj.com/content/387/bmj-2023-078445

Chopra, A., Doiphode, V.V. *et al.* 2010. Ayurveda–modern medicine interface: A critical appraisal of current evidence and future directions. *Journal/PMC Article*. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3087360/

Morandi, A., Tosto, C., Sartori, G. and Roberti di Sarsina, P. 2011. Advent of a link between Ayurveda and Modern Health Science: The proceedings of the First International Congress on Ayurveda, "Ayurveda: The Meaning of Life – Awareness, Environment, and Health" March 21–22, 2009, Milan, Italy. In Evidence-based complementary and alternative medicine (Vol. 2011, p. 929083). London: Hindawi Limited. doi:10.1155/2011/929083

Kumar, M.J. 2024. Integrating Indian Knowledge Systems in higher education: Evidence and pathways. *Contemporary Education Review*, (Note: see Taylor & Francis online article: https://www.tandfonline.com/doi/full/10.1080/02564602.2024.2342625)

Ministry of AYUSH (MoA) 2023. Govt. of India National Repository on AYUSH COVID-19 Clinical and Other R&D Initiatives at AYUSH Research Portal. https://ayushportal.nic.in/pdf/Research_and_Development_Initiatives_of_Ministry_of_Ayush_for_COVID-19.pdf (2023)