REVIVING INDIAN KNOWLEDGE SYSTEMS THROUGH AI: A CSR-DRIVEN EDUCATIONAL MODEL FOR CIRCULAR ECONOMY AND GLOBAL SUSTAINABILITY

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Abstract :

This paper proposes a conceptual framework for integrating Indian Knowledge Systems (IKS) into sustainability education through artificial intelligence (AI), corporate social responsibility (CSR), and policy alignment with India's National Education Policy 2020 (NEP 2020) and the United Nations Sustainable Development Goals (UN SDGs). The approach emphasizes AI as a tool for digitizing and contextualizing IKS content, enabling multilingual access and experiential learning in rural and underserved regions[1].

CSR provisions under Section 135 of the Companies Act 2013 have facilitated investments in education, environment, and heritage sectors[2]. NEP 2020 recommends the inclusion of IKS in curricula and promotes multidisciplinary, value-based education[3]. Concurrently, India's commitment to the UN SDGs—particularly SDG 4 (Quality Education), SDG 12 (Responsible Consumption), and SDG 13 (Climate Action)—provides a global framework for aligning indigenous knowledge with sustainability goals[4].

The proposed model outlines how AI-enabled IKS modules can be supported by CSR funding and deployed through educational platforms to promote circular economy principles, ecological awareness, and cultural continuity. This paper does not document completed implementations but presents a strategic roadmap for future research, pilot programs, and policy integration.

Keywords : Indian Knowledge Systems (IKS), Artificial Intelligence (AI), Corporate Social Responsibility (CSR), Circular Economy, NEP 2020, UN Sustainable Development Goals (SDGs), Sustainability Education

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Introduction :

Indian Knowledge Systems (IKS) encompass a diverse body of indigenous knowledge developed over centuries, including disciplines such as agriculture, architecture, medicine, mathematics, linguistics, and ecological stewardship[1]. These systems reflect regionally embedded practices and philosophical frameworks that emphasize sustainability, interdependence, and ethical living. Despite their relevance to contemporary challenges, IKS remains underrepresented in formal education and development discourse.

The National Education Policy 2020 (NEP 2020) recognizes the importance of integrating IKS into mainstream curricula, advocating for experiential, multidisciplinary, and culturally rooted learning[2]. It recommends the inclusion of IKS in school and higher education programs, alongside the development of digital content and teacher training modules. This policy intent aligns with broader national goals of inclusive education and cultural preservation.

Artificial Intelligence (AI) offers new possibilities for digitizing, contextualizing, and disseminating IKS content. AI tools such as natural language processing, voice interfaces, and adaptive learning systems can support multilingual access, personalized learning, and community engagement[3]. These technologies are being explored under India's national AI strategy, which emphasizes social impact, inclusive growth, and ethical deployment[4].

Corporate Social Responsibility (CSR), mandated under Section 135 of the Companies Act 2013, provides a funding and implementation mechanism for educational and sustainability initiatives[5]. CSR projects in India have supported digital literacy, environmental awareness, and heritage conservation—domains where IKS and AI can intersect meaningfully. When aligned with NEP 2020 and the UN Sustainable Development Goals (SDGs), CSR-led IKS initiatives can contribute to SDG 4 (Quality Education), SDG 12 (Responsible Consumption and Production), and SDG 13 (Climate Action)[6].

This paper proposes a conceptual framework for integrating AI-enabled IKS modules into CSR-funded educational programs, with a focus on sustainability and circular economy themes. It does not document completed implementations but outlines strategic pathways for policy alignment, technological design, and community-based deployment.

Objectives and Research Questions :

1. Research Objectives :

This study aims to develop a conceptual framework for integrating Indian Knowledge Systems (IKS) into sustainability education through artificial intelligence (AI) and corporate social responsibility (CSR), in alignment with India's National Education Policy 2020 (NEP 2020) and the United Nations Sustainable Development Goals (UN SDGs)[1]. The specific objectives are:

- To examine how AI technologies can support the digitization, contextualization, and dissemination of IKS content for educational and ecological purposes[2]
- To identify CSR mechanisms that can fund and implement AI-enabled IKS initiatives, particularly in rural and underserved regions[3]
- To analyze the policy convergence between NEP 2020, CSR mandates, and India's SDG commitments, with emphasis on SDG 4 (Quality Education), SDG 12 (Responsible Consumption), and SDG 13 (Climate Action)[4]
- To propose a scalable educational model that uses AI to deliver IKS-based sustainability content through CSR-supported platforms, contributing to circular

economy awareness and community engagement[5]

2. Research Questions :

1. *How can artificial intelligence be applied to digitize and disseminate Indian Knowledge Systems in ways that support sustainability education and circular economy principles[6]?*
2. *What role can CSR funding and partnerships play in operationalizing AI-enabled IKS initiatives, especially in alignment with NEP 2020 and SDG targets[7]?*
3. *What are the policy and implementation challenges in integrating IKS, AI, and CSR within India's educational and sustainability frameworks[8]?*
4. *How can a conceptual model be designed to ensure ethical, inclusive, and culturally sensitive deployment of AI in IKS-based learning environments[9]?*

3. Literature Review :

1. Indian Knowledge Systems and Educational Integration :

Indian Knowledge Systems (IKS) encompass a wide array of indigenous disciplines, including agriculture, architecture, metallurgy, medicine, mathematics, and ecological ethics[1]. NEP 2020 formally recognizes IKS as a valuable educational resource and recommends its integration into curricula at all levels[2]. The policy outlines the need for experiential, multidisciplinary, and culturally rooted learning, including the development of digital content and teacher training modules. However, implementation remains limited, and most IKS content is not yet digitized or pedagogically structured for contemporary learners[3].

Scholarly work has emphasized the potential of IKS to contribute to sustainability education, particularly in areas such as organic farming, water conservation, and circular resource use[4]. These domains align with traditional practices documented in Vedic, Buddhist, and tribal knowledge systems. Yet, the lack of interoperable platforms and standardized frameworks has hindered broader adoption[5].

2. Artificial Intelligence and Educational Access :

India's national AI strategy, articulated by NITI Aayog, identifies education and sustainability as priority sectors for AI deployment[6]. The #AIforAll initiative promotes inclusive growth through AI applications in multilingual learning, adaptive content delivery, and skill development. MeitY's IndiaAI and AIRAWAT programs provide infrastructure for AI research and cloud-based educational tools[7].

AI technologies such as natural language processing (NLP), speech recognition, and machine learning have demonstrated potential in digitizing and contextualizing indigenous knowledge[8]. These tools can support multilingual access, personalized learning pathways, and community engagement. However, challenges persist in ensuring cultural fidelity, ethical design, and equitable access[9].

3. CSR and Sustainability Education :

Corporate Social Responsibility (CSR) in India is governed by Section 135 of the Companies Act 2013, which mandates eligible companies to allocate a portion of profits toward social development[10]. Education, environment, and heritage preservation are among the top-funded sectors, as documented on the official CSR portal[11]. Several CSR projects have supported digital literacy, ecological awareness, and community-based learning, though few have explicitly focused on IKS or AI-enabled sustainability education[12].

The convergence of CSR funding with NEP 2020 goals and SDG targets presents an opportunity to design scalable, culturally relevant educational models. CSR can serve as a mechanism for piloting AI-enabled IKS modules, particularly in rural and tribal regions where formal infrastructure is limited[13].

4. UN SDGs and Indigenous Knowledge :

The United Nations recognizes indigenous knowledge as a critical resource for achieving the Sustainable Development Goals (SDGs), especially in areas related to climate action, biodiversity, and education[14]. India's SDG localization efforts, supported by UNDP and NITI Aayog, have included documentation of best practices in agriculture, water management, and community engagement[15]. These practices often draw from IKS but lack systematic integration into formal education or digital platforms.

SDG 4 (Quality Education), SDG 12 (Responsible Consumption and Production), and SDG 13 (Climate Action) are directly relevant to IKS-based sustainability education. AI can serve as a bridge between traditional knowledge and global frameworks, provided ethical and participatory design principles are upheld[16].

To ensure that AI serves as a respectful bridge between traditional knowledge and global frameworks, its deployment must be guided by ethical and participatory design principles. These include cultural fidelity in content representation, linguistic inclusivity for diverse learners, community consent in knowledge digitization, and equitable access to digital platforms. Such safeguards are essential to prevent misappropriation, distortion, or exclusion of indigenous perspectives in the pursuit of sustainability education.

4. Methodology and Framework :

This study adopts a conceptual and policy-aligned approach to develop a strategic framework for integrating Indian Knowledge Systems (IKS) into sustainability education through artificial intelligence (AI) and corporate social responsibility (CSR), in alignment with India's National Education Policy 2020 (NEP 2020) and the United Nations Sustainable Development Goals (UN SDGs)[1].

1. Conceptual Design :

The framework is structured around three intersecting domains :

- **Knowledge Systems** : Indigenous practices and epistemologies relevant to sustainability, circular economy, and ethical living[2]
- **Technological Infrastructure** : AI tools for digitization, multilingual access, and adaptive learning[3]
- **Institutional Mechanisms** : CSR funding, NEP-aligned curriculum integration, and SDG-linked monitoring[4]

This triadic model is intended to guide future pilot programs, policy proposals, and collaborative research.

2. Data Sources :

The framework is informed by publicly available policy documents, including NEP 2020; National Strategy for AI; IndiaAI and AIRAWAT; CSR.gov.in); and the UN SDG India Index and UNDP Compendium.

- NEP 2020 (Ministry of Education)[5]
- National Strategy for AI (NITI Aayog)[6]
- IndiaAI and AIRAWAT (MeitY)[7]
- CSR.gov.in (Ministry of Corporate Affairs)[8]
- UN SDG India Index and UNDP Compendium[9]

No primary field data is used. The study remains conceptual and exploratory.

3. Analytical Lens :

The analysis applies a systems-thinking lens to identify convergence points between IKS, AI, CSR, and sustainability education. It considers:

- Policy intent and implementation gaps
- Technological feasibility and ethical considerations
- Funding mechanisms and stakeholder roles
- Alignment with SDG targets and indicators[10]

The framework does not claim empirical validation but aims to support future research and program design.

4. Limitations :

This study is limited by the absence of field-level data, implementation metrics, and stakeholder interviews. It does not evaluate existing projects or platforms. The framework is intended as a strategic proposal subject to further validation.

5. Approach and Initiatives :

This section outlines a conceptual model for integrating Indian Knowledge Systems (IKS) into sustainability education through artificial intelligence (AI) and corporate social

responsibility (CSR), in alignment with India's National Education Policy 2020 (NEP 2020) and the United Nations Sustainable Development Goals (UN SDGs)[1].

1. AI-Enabled IKS Modules :

AI technologies such as natural language processing (NLP), speech recognition, and adaptive learning systems can be used to digitize and deliver IKS content in regional languages[2]. These modules may include topics such as traditional water management, organic farming, zero-waste practices, and ecological ethics[3]. AI can support personalized learning pathways, voice-based access for low-literacy users, and semantic tagging for content retrieval[4].

2. CSR-Funded Educational Platforms :

CSR funds can be allocated to develop and deploy AI-enabled IKS modules in rural and tribal regions, consistent with CSR Schedule VII provisions under the Companies Act 2013[5]. Documented CSR projects in education and environment have supported digital literacy, heritage preservation, and community-based learning[6]. These platforms may operate through schools, community centers, or mobile units, with content aligned to NEP 2020 learning outcomes[7].

3. Circular Economy Themes :

IKS offers practical knowledge relevant to circular economy principles, including reuse, regeneration, and resource efficiency[8]. Examples include traditional composting, seed preservation, and sustainable architecture. AI can help simulate these practices through interactive modules, enabling learners to understand ecological cycles and apply them locally[9].

4. Policy-Convergent Design :

The proposed model aligns with:

- ***NEP 2020***: Multidisciplinary, experiential, and culturally rooted education[10]
- ***IndiaAI Strategy***: AI for inclusive growth and social impact[11]
- ***CSR Mandate***: Education and environment as priority sectors[12]
- ***UN SDGs***: SDG 4 (Quality Education), SDG 12 (Responsible Consumption), SDG 13 (Climate Action)[13]

This convergence supports the design of educational programs that are culturally relevant, technologically enabled, and globally aligned.

6. Results, Impact, and Discussion :

This section presents a conceptual analysis of the potential outcomes and strategic implications of integrating Indian Knowledge Systems (IKS) into sustainability education through artificial intelligence (AI) and corporate social responsibility (CSR), in alignment with India's National Education Policy 2020 (NEP 2020) and the United Nations Sustainable

Development Goals (UN SDGs)[1].

1. Anticipated Outcomes :

While no empirical data is presented, the proposed model suggests several plausible outcomes based on policy intent and technological feasibility :

- **Expanded Access to IKS Content**: AI-enabled platforms can digitize and deliver IKS modules in regional languages, making traditional knowledge accessible to learners across geographies and literacy levels[2]
- **Enhanced Sustainability Awareness**: IKS-based modules on ecological ethics, resource cycles, and regenerative practices can foster deeper understanding of circular economy principles[3]
- **CSR-Driven Educational Innovation**: CSR funding can support the development of culturally rooted, AI-powered educational tools, especially in underserved regions[4]
- **Policy Convergence and SDG Alignment**: The integration of IKS, AI, and CSR can contribute to SDG 4 (Quality Education), SDG 12 (Responsible Consumption), and SDG 13 (Climate Action), while fulfilling NEP 2020's mandate for experiential and value-based learning[5]

These outcomes are contingent on collaborative implementation, ethical design, and sustained policy support.

2. Strategic Impact :

The strategic impact of this model lies in its capacity to bridge traditional wisdom with contemporary innovation. By positioning Indian Knowledge Systems (IKS) as a living resource for sustainability education, the framework redefines how indigenous knowledge is valued and applied. Artificial intelligence (AI) functions not as a substitute for human insight but as an enabler of enhanced access, personalization, and scalability[6].

Corporate Social Responsibility (CSR) transcends its role as a compliance mechanism to become a catalyst for cultural stewardship and ecological regeneration. Companies investing in AI-enabled IKS education contribute not only to social development but also to long-term environmental resilience[7].

The National Education Policy 2020 (NEP 2020) offers the curricular and pedagogical foundation, while the United Nations Sustainable Development Goals (SDGs) provide a global benchmark for impact measurement. Together, these policies create a fertile environment for designing educational programs that are both locally contextualized and globally benchmarked[8].

3. Ethical and Cultural Considerations :

The deployment of AI in IKS education must be guided by ethical principles, including:

- **Cultural Fidelity**: Ensuring that digitized content respects the integrity of indigenous

narratives and epistemologies[9]

- **Inclusive Design**: Building platforms that accommodate linguistic diversity, low-bandwidth environments, and varied learning styles[10]
- **Data Ethics**: Protecting user privacy, consent, and community ownership of knowledge[11]
- **Participatory Governance**: Involving educators, scholars, and local communities in content creation and platform design[12]

These considerations are essential to avoid extractive or reductive approaches to IKS digitization.

4. Challenges and Mitigation :

Several challenges may arise in operationalizing the proposed model :

- **Infrastructure Gaps** : Limited digital access in rural areas may hinder deployment. Mitigation includes offline-first design and mobile-based delivery[13]
- **Content Standardization** : Diverse IKS traditions require careful curation and contextualization. Mitigation involves modular design and expert review[14]
- **Funding Continuity** : CSR funding cycles may be short-term. Mitigation includes multi-stakeholder partnerships and integration with public schemes[15]
- **Policy Fragmentation** : Coordination across ministries and sectors may be complex. Mitigation involves inter-agency collaboration and shared metrics[16]

Addressing these challenges requires strategic planning, adaptive design, and policy coherence.

5. Policy Implications :

The proposed framework has several implications for policy design, inter-sectoral coordination, and long-term educational planning in India.

1. Strengthening NEP 2020 Implementation :

NEP 2020 advocates for the integration of Indian Knowledge Systems (IKS) into formal education, yet operational guidelines remain fragmented[1]. The use of AI to digitize and contextualize IKS content can accelerate curriculum development, teacher training, and resource dissemination. Policymakers may consider issuing model curricula, digital repositories, and multilingual content standards to support scalable adoption[2].

2. Expanding CSR Scope Toward Cultural and Ecological Education :

While CSR funding has supported education and environment projects, explicit

inclusion of IKS-based sustainability education remains limited[3]. The Ministry of Corporate Affairs may consider updating CSR Schedule VII to include indigenous knowledge dissemination as a recognized activity. This would incentivize companies to invest in culturally rooted, AI-enabled educational platforms[4].

3. Aligning AI Strategy with Grassroots Knowledge Systems :

India's AI strategy emphasizes social impact and inclusive growth, but current initiatives focus primarily on agriculture, healthcare, and skilling[5]. Integrating IKS into AI research agendas—through platforms like AIRAWAT—can diversify content domains and promote ethical, context-sensitive innovation. This requires collaboration between MeitY, academic institutions, and IKS scholars[6].

4. Localizing SDG Implementation Through IKS :

India's SDG localization efforts have documented best practices in sustainability, many of which draw from indigenous traditions[7]. However, these practices are rarely integrated into formal education or digital platforms. Policy frameworks may benefit from explicitly linking IKS-based learning to SDG indicators, enabling measurable contributions to SDG 4, SDG 12, and SDG 13[8].

5. Enabling Inter-Ministerial Collaboration :

Effective implementation of the proposed framework requires coordinated action across multiple government ministries, including Education, Corporate Affairs, Electronics & Information Technology, Tribal Affairs, and Environment[9]. Establishing a dedicated inter-ministerial working group or joint task force could facilitate the development of shared standards, coordinated funding mechanisms, and unified monitoring frameworks. This collaborative approach would ensure that AI-enabled IKS education initiatives are not fragmented or siloed but are embedded strategically within national education, sustainability, and digital innovation agendas.

Conclusion and Future Directions :

This paper has proposed a conceptual framework for integrating Indian Knowledge Systems (IKS) into sustainability education through artificial intelligence (AI) and corporate social responsibility (CSR), aligned with India's National Education Policy 2020 (NEP 2020) and the United Nations Sustainable Development Goals (UN SDGs)[1]. The model emphasizes policy convergence, technological feasibility, and ethical design as foundational principles for future implementation.

IKS offers a rich repository of ecological wisdom, regenerative practices, and value-based learning that remain relevant to contemporary challenges in climate resilience, resource efficiency, and community engagement[2]. AI technologies can serve as enablers for digitizing and disseminating this knowledge, provided they are deployed with cultural sensitivity and inclusive design[3]. CSR mechanisms offer a viable funding and outreach strategy, especially

in regions underserved by formal education infrastructure[4].

The framework does not claim empirical validation but presents a strategic roadmap for future research, pilot programs, and policy experimentation. It invites collaboration among educators, technologists, policymakers, and community stakeholders to co-create educational models that are locally grounded and globally aligned.

Future Research :

Future studies may focus on:

- Field-level validation of AI-enabled IKS modules in rural and tribal contexts.
- Impact assessment of CSR-funded sustainability education programs.
- Development of multilingual AI tools for indigenous content delivery.
- Policy analysis of inter-ministerial coordination and SDG-linked educational metrics.

Such research would contribute to operationalizing the proposed framework and refining its design based on empirical evidence.

Closing Perspective :

Reviving Indian Knowledge Systems through artificial intelligence is not a nostalgic endeavour; it is a strategic imperative. It offers a transformative pathway to reimagine education as a medium for ecological stewardship, cultural continuity, and ethical innovation. When supported by corporate social responsibility and aligned with the National Education Policy 2020 and the Sustainable Development Goals, this approach can help shape a future where tradition and technology coalesce to empower local communities and advance global sustainability goals.

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