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BHARAT BRAIN TRUST:

FROM NALANDA TO NANO TECHNOLOGY,
RECLAIMING INTELLECTUAL SOVEREIGNTY

Edited by: Dr Joydeb Patra, Dr Prodipta Barman, Dr Tamal Gupta



Bharat Brain Trust

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Reclaiming Intellectual Sovereignty

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SERIES EDITOR:
Dr. Javed Khan Bhutto

Edited by
Dr. Joydeb Patra
Dr. Prodipta Barman
Dr. Tamal Gupta

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PREFACE

The history of Bharat's intellectual tradition is a profound saga of inquiry, debate, and an unrelenting pursuit of truth. For millennia, the Indian subcontinent has served as a fertile ground for philosophical reflection, scientific experimentation, ethical reasoning, and artistic creativity. From the ancient universities of Nalanda, Takshashila, Vikramashila, and Vallabhi—renowned across Asia for their cosmopolitan scholarship—to the contemporary advances in space science, digital technology, and nanotechnology, Bharat's engagement with knowledge has been continuous, dynamic, and transformative. Yet, despite this vast and diverse intellectual legacy, much of Bharat's contribution to global knowledge systems has remained underrepresented, misinterpreted, or marginalised within dominant historical narratives. Colonial historiography, driven by Eurocentric assumptions, often portrayed Indian knowledge traditions as static, mystical, or inferior to Western scientific rationality. This selective framing not only obscured the originality and rigour of indigenous epistemologies but also disrupted the organic continuity between ancient wisdom and modern innovation. In the postcolonial period, while political sovereignty was achieved, intellectual sovereignty remained incomplete—shaped largely by borrowed frameworks, external validations, and fragmented engagement with indigenous traditions.

Bharat's Brain Trust: From Nalanda to Nanotechnology—Reclaiming Intellectual Sovereignty emerges as a response to this historical rupture. The book seeks to revisit, reinterpret, and reclaim Bharat's intellectual heritage, not as a nostalgic exercise in cultural pride, but as a critical and constructive engagement with the past to inform the future. It argues that reclaiming intellectual sovereignty is essential for building a self-reliant, creative, and equitable knowledge society in the twenty-first century.

One of the central premises of this work is the idea of continuity between ancient epistemic traditions and modern scientific thought. Indian intellectual history does not represent a linear progression in the Western sense, nor does it conform neatly to disciplinary silos. Instead, it reflects a pluralistic and

dialogic tradition where philosophy, science, metaphysics, medicine, mathematics, linguistics, and ethics evolved in constant conversation with one another. The debates among different schools of philosophy—Nyāya, Sāṃkhya, Vedānta, Buddhism, Jainism, and Cārvāka—demonstrate a sophisticated culture of reasoning, logic, and critique. The methodological rigour of Indian logic (Hetuvidyā), the grammatical precision of Pāṇini, the astronomical calculations of Āryabhaṭa, the medical insights of Caraka and Suśruta, and the metallurgical and architectural innovations evident in ancient India all testify to a civilisation deeply invested in empirical observation and rational inquiry.

Institutions such as Nalanda were not merely centers of learning; they were global hubs of knowledge exchange, attracting scholars from China, Korea, Tibet, Central Asia, and Southeast Asia. These institutions exemplified an educational ethos rooted in debate, interdisciplinarity, and intellectual freedom—values that resonate strongly with contemporary ideals of higher education. The colonial encounter marked a significant rupture in this intellectual continuity. Colonial education policies systematically devalued indigenous knowledge systems, privileging Western epistemologies as universal and scientific while relegating Indian traditions to the realm of the pre-modern or spiritual. This epistemic hierarchy resulted in what contemporary scholars describe as epistemic injustice—the denial of credibility, legitimacy, and authority to non-Western ways of knowing.

The consequences of this disruption persist even today. Modern education systems in India often remain disconnected from indigenous intellectual traditions, leading to a fragmented understanding of knowledge and innovation. Students are trained to consume global knowledge but are rarely encouraged to engage critically with India's own intellectual resources. As a result, the potential for contextual innovation and culturally rooted problem-solving remains underutilised. This book does not advocate for the rejection of Western knowledge systems. Instead, it calls for epistemic plurality—a balanced and critical engagement where indigenous knowledge traditions coexist, interact,

and innovate alongside global scientific paradigms. Intellectual sovereignty, in this sense, is not isolationist but integrative.

India's recent strides in space exploration, digital governance, biotechnology, and nanoscience further demonstrate the country's potential to emerge as a global knowledge leader. However, for this potential to be fully realised, innovation must be grounded in cultural self-confidence and ethical reflection—qualities deeply embedded in Bharat's intellectual heritage. At its core, this book engages with the broader global discourse on the decolonisation of knowledge. Decolonisation, as understood here, is not merely about rewriting history but about transforming the structures through which knowledge is produced, validated, and disseminated. It involves questioning inherited assumptions, recovering marginalised voices, and fostering intellectual autonomy. Reclaiming Bharat's intellectual sovereignty also entails cultivating cultural self-confidence. A society uncertain of its intellectual past struggles to imagine its future. By revisiting India's contributions to global knowledge, this work seeks to inspire a renewed sense of purpose among scholars, students, policymakers, and citizens alike. The chapters presented in this volume bring together philosophical reflections, historical reconstructions, and contemporary analyses across disciplines. They collectively offer a panoramic view of India's intellectual legacy while addressing present-day challenges such as globalisation, technological ethics, educational reform, and sustainable development.

In the twenty-first century, nations are increasingly defined not merely by economic or military power but by their capacity to generate, apply, and ethically govern knowledge. For India, reclaiming intellectual sovereignty is integral to its global positioning as a knowledge society. This involves reimagining education, encouraging interdisciplinary research, and fostering innovation that is both globally competitive and locally rooted. True sovereignty, as this book argues, lies as much in ideas as in institutions. Political independence without intellectual autonomy remains incomplete. By reconnecting with its civilizational wisdom while engaging critically with contemporary realities, Bharat can contribute not only to its own development but also to global debates on knowledge, ethics, and human flourishing.

Bharat's Brain Trust: From Nalanda to Nanotechnology—Reclaiming Intellectual Sovereignty is a modest yet sincere attempt to bridge the past and the present, tradition and innovation, heritage and futurity. It does not claim to offer definitive answers but seeks to provoke reflection, dialogue, and renewed inquiry.

The hope underlying this work is that it contributes meaningfully to academic discourse, policy debates, and cultural conversations around decolonisation of knowledge, intellectual self-reliance, and India's role in shaping the global knowledge order. In rediscovering the richness of Bharat's intellectual tradition, we may also rediscover the confidence to imagine and create a more just, innovative, and sustainable future.

ACKNOWLEDGEMENT

The making of this book has been both an intellectual journey and a collective endeavour—one shaped by dialogue, collaboration, and sustained reflection. From the earliest stages of conceptualisation to the final shaping of the manuscript, this project has benefited immensely from the encouragement, critique, and generosity of numerous individuals and institutions. As editors, we acknowledge these contributions with deep humility and gratitude.

We are profoundly indebted to our mentors, colleagues, and scholarly peers who offered guidance at crucial moments in the evolution of this work. Their insights challenged us to think more rigorously, situate our arguments more carefully, and remain attentive to both historical depth and contemporary relevance. The confidence to pursue complex and sometimes difficult questions emerged not in isolation, but through sustained intellectual exchange. The conversations we shared—across seminars, conferences, classrooms, and informal discussions—were not only academically enriching but also deeply affirming, reminding us that scholarship thrives in a spirit of shared inquiry and mutual respect.

This volume also stands on the shoulders of scholars whose pioneering research has illuminated the many dimensions of India's intellectual heritage. Their work—spanning philosophy, science, history, culture, and technology—has laid a strong foundation upon which this book seeks to build. We recognise that reclaiming and reinterpreting Bharat's intellectual traditions is an ongoing collective effort, and this book is but one contribution to a much larger scholarly conversation.

We extend our sincere appreciation to the institutions, libraries, archives, and research centers that continue to preserve and disseminate India's vast knowledge legacy. These repositories of memory and meaning play an indispensable role in sustaining intellectual continuity across generations. Without their commitment to preservation and access, engaging critically with Bharat's civilizational thought would not be possible.

A special word of thanks is due to the contributors to this volume. Their willingness to engage with the central themes of intellectual sovereignty, epistemic continuity, and decolonisation of knowledge enriched the book in ways we could not have anticipated at the outset. Each chapter brings a distinct perspective while contributing to a shared intellectual vision. We are equally grateful to the reviewers and readers of earlier drafts whose constructive critiques helped sharpen arguments, clarify concepts, and broaden the analytical scope of the work. Their engagement significantly strengthened the final manuscript.

We would also like to acknowledge the broader academic community—students, early-career scholars, and fellow researchers—whose questions and curiosity continually reminded us of the relevance of this endeavour. Their interest reaffirmed our belief that reclaiming intellectual sovereignty is not merely an academic exercise but a vital cultural and educational imperative.

On a more personal note, we express our heartfelt gratitude to our families. Their patience, understanding, and quiet sacrifices made it possible for us to devote the time and energy required for this project. The long hours of reading, writing, editing, and reflection were sustained by their unwavering support and belief in the purpose of this work. Their presence has been a constant source of strength and encouragement.

Finally, we turn to the readers. A book attains meaning only when it is read, questioned, debated, and carried forward into new conversations. We thank you for engaging with this volume and invite you to approach it not as a closed text, but as an open dialogue. We hope that this work stimulates curiosity, fosters critical reflection, and contributes to a renewed confidence in Bharat's enduring spirit of inquiry.

If this book encourages readers to re-examine inherited narratives, engage more deeply with India's intellectual traditions, and imagine new possibilities for a self-aware and ethically grounded knowledge society, then it will have fulfilled its purpose. We offer this volume in that spirit.

FOREWORD

Human history has often been defined by civilisations that dared to think differently, and Bharat stands among the most profound exemplars of intellectual brilliance. For millennia, this land nurtured ideas that shaped humanity's understanding of the cosmos, the human body, ethics, governance, and the nature of reality itself. Its legacy—stretching from the analytical rigour of Nyaya philosophy to the spiritual depth of Vedanta, from Aryabhata's pioneering astronomical insights to the spirited debates at Nalanda, and from the surgical genius of Sushruta to India's remarkable achievements in modern space exploration—reflects an uninterrupted continuum of creativity and inquiry unparalleled in world history. This book, ***Bharat's Brain Trust: From Nalanda to Nanotechnology, Reclaiming Intellectual Sovereignty***, captures that continuum with clarity and conviction. It is not merely about chronicling milestones of knowledge but about reclaiming the intellectual sovereignty that has too often been overshadowed by colonial narratives and global hegemonies of thought. True sovereignty lies not only in political or economic strength but also in the ability of a society to define, preserve, and evolve its own knowledge systems. This volume powerfully reminds us of that imperative. In today's world, increasingly shaped by knowledge economies, innovation hubs, and digital frontiers, Bharat must rediscover the confidence that once made it a beacon of learning for the world. The vision here is both restorative and forward-looking. It encourages us to draw inspiration from ancient traditions while engaging with the demands of modern science and technology. It is in this synthesis—between the contemplative and the scientific, the cultural and the technological—that the path toward true self-reliance and global leadership lies. I commend the author(s) for undertaking this timely and important endeavour. The book is not merely a historical narrative but a call to introspection and action. It invites scholars, students, policymakers, and citizens alike to participate in the larger project of rebuilding confidence in Bharat's intellectual traditions while innovating for the future. I am confident that ***Bharat's Brain Trust*** will inspire dialogue, scholarship, and renewed conviction in India's rightful place as a knowledge power in the 21st century.

ABOUT THE EDITORS



Dr. Joydeb Patra is an accomplished sociologist and academic currently serving as Assistant Professor in the Department of Sociology (School of Law) at Brainware University, Kolkata, India. His academic journey began with a Bachelor's degree in Sociology from West Bengal State University, followed by a Master's degree in Sociology from Rabindra Bharati University. He earned his Ph.D. from Vidyasagar University, with a research focus in Medical Sociology, laying a strong foundation for his scholarly pursuits. Dr. Patra's research interests encompass social inclusion and exclusion, community dynamics, medical sociology, and the sociological

implications of law and policy. He has published in reputable UGC CARE and SCOPUS-indexed journals and contributed to interdisciplinary topics such as the sociological dimensions of cyber laws and artificial intelligence.



Dr. Prodipta Barman is an Assistant Professor at the School of Law, Brainware University, West Bengal. He is actively engaged in teaching and research in the fields of law and legal studies, with a particular interest in interdisciplinary perspectives that connect law with society, governance, and justice. Dr. Barman has contributed scholarly works in reputed journals and edited volumes and regularly participates in academic conferences, seminars, and faculty development programmes. He is committed to fostering critical legal thinking among

students and promoting research-driven legal education. His academic pursuits

reflect a strong dedication to contemporary legal issues and emerging challenges in the Indian legal system.



Dr. Tamal Gupta is an Associate Professor at Brainware University with over 12 years of academic experience. A Ph.D. holder from Sambalpur University and a Business Law specialist from Bharati Vidyapeeth, he possesses diverse expertise in Human Rights Jurisprudence and Corporate Law. He is a prolific researcher and resource person for State Police Academies.

CHAPTER – 1

A STUDY ON BUILDING SUSTAINABILITY THROUGH E-WASTE RECOVERY AND GREEN JOB CREATION

Dr. GARGEE BASU
Assistant Professor,
School of Law, Brainware University, Barasat, India

1. Introduction

The rapid pace of technological development in recent decades has brought about significant transformations in how societies function, communicate, and consume. While these advancements have led to improved convenience, productivity, and connectivity, they have also resulted in an alarming rise in the generation of electronic waste (e-waste). As modern gadgets and digital devices become obsolete within increasingly shorter timeframes, their disposal has become a pressing concern. This surge in discarded electronic products poses serious threats to both the environment and public health due to the presence of hazardous materials such as lead, mercury, and cadmium. The improper handling and disposal of e-waste contaminate soil, air, and water, thereby endangering ecosystems and human well-being, especially in developing nations

where regulatory mechanisms are often weak or poorly enforced.

In response to these challenges, the concept of a circular economy has gained prominence as an alternative to the traditional linear model of 'take, make, dispose.' The circular economy encourages a restorative and regenerative approach that prioritizes the extension of product life cycles through practices such as recycling, repairing, refurbishing, and reusing. This model aims to minimize waste, reduce dependency on virgin raw materials, and promote environmental resilience. Furthermore, the shift toward a circular economy is creating a new category of employment opportunities, commonly referred to as green jobs. These roles are rooted in sustainable practices and serve the dual purpose of protecting the environment while promoting inclusive growth. Green jobs contribute not only to economic development but also to social progress by addressing disparities in access to employment and resources. They play an important role in advancing social welfare goals, especially when integrated with community-driven initiatives and policies that prioritize environmental justice and sustainable livelihoods.

The continual surge in technological innovations has become a defining feature of the modern era. While these developments have enhanced various aspects of daily life, including communication, education, healthcare, and commerce, they have also contributed to a growing environmental burden. One of the most critical outcomes of this trend is the exponential increase in electronic waste. As consumer demand for the latest electronic products rises, older devices are frequently discarded, often without proper disposal or recycling methods in place. This uncontrolled accumulation of e-waste presents serious hazards, not only to natural ecosystems but also to human health, particularly due to the toxic substances contained in many electronic components. In countries like India, where waste management systems are still evolving, the impact is more severe, affecting informal workers and urban communities alike.

To counter these adverse effects, the adoption of the circular economy model is gaining momentum. This model focuses on extending the lifespan of products and materials through reuse, refurbishment, and recycling, reducing the need for continuous extraction of natural resources. Unlike the conventional approach that treats waste as the end of a product's life, the circular economy sees waste as a resource that can be reintegrated into the

production cycle. As this model becomes more widespread, it is giving rise to employment sectors that are environmentally sustainable. These are known as green jobs—roles that support ecological preservation while also generating economic and social value. Green jobs contribute to reducing unemployment, especially among youth and marginalized groups, while also promoting practices that support long-term environmental health. Their emergence signals a shift towards a more balanced and equitable form of development where social welfare, environmental protection, and economic growth go hand in hand.

2. E-Waste and The Need for Sustainable Solutions

Important to mention about the electronic waste, or e-waste that refers to discarded electronic devices and components, including mobile phones, laptops, printers, televisions, refrigerators, and other household and industrial gadgets. As the rate of technological consumption accelerates, the life span of such products continues to shorten, leading to an unprecedented accumulation of obsolete electronics. When these discarded items are not handled properly, they release harmful chemicals such as lead, mercury, cadmium, and brominated flame retardants into the environment. These substances can leach into soil and groundwater or enter the air through burning, resulting in serious threats to public health and ecological systems.

Despite its dangers, e-waste is also a valuable secondary source of materials. Many discarded electronics contain precious and rare metals such as gold, silver, palladium, copper, and rare earth elements. These materials can be extracted through systematic recycling processes, thereby reducing the pressure on natural mining operations and conserving finite resources. Unfortunately, in countries like India, a large portion of e-waste is handled informally, often by untrained workers without protective equipment, posing severe risks to human health and limiting the economic potential of proper material recovery.

Integrating strategies like reuse, repair, refurbishment, and recycling into the management of e-waste not only limits environmental damage but also significantly reduces the need for new raw materials and energy consumption. These methods contribute directly to climate action, resource efficiency, and sustainable production—all of which are key components of global sustainability goals. More importantly, these practices open up new avenues for employment in the growing field of green jobs. Jobs in repair workshops,

certified recycling units, materials recovery facilities, and e-waste auditing require skills that are increasingly in demand. This emerging sector supports inclusive economic growth by creating livelihoods, especially for urban youth and marginalized communities, while contributing positively to environmental protection.

The adoption of circular economy principles in the context of e-waste promotes systemic change. Instead of treating electronic products as disposable, the circular approach emphasizes designing products for longevity, ease of disassembly, and recyclability. It encourages a shift from consumerism to a more responsible use of technology. In doing so, it fosters industries based on sustainability, which in turn creates stable, dignified employment opportunities. Green employment in this context is not only about protecting the planet but also about building resilience in communities by providing meaningful work aligned with environmental values.

3. Green Jobs: Recycling, Repair, and Innovation.

The transition towards a circular economy is opening new frontiers in employment by fostering a wide range of environmentally sustainable occupations commonly referred to as green jobs. These jobs are not only rooted in ecological responsibility but also promote social equity by offering meaningful work to underrepresented and economically disadvantaged populations. Among the most prominent areas of green employment are recycling, repair, and innovation—three interconnected sectors that lie at the heart of resource efficiency and environmental stewardship.

Recycling plays a pivotal role in recovering valuable materials from discarded products, thereby reducing the need for extracting virgin resources. Workers engaged in recycling are involved in the collection, segregation, dismantling, and processing of waste materials, turning potential pollutants into usable raw materials. According to a report by the Central Pollution Control Board (CPCB, 2023), India generated around 1.6 million tonnes of e-waste in 2021-22, a figure that is steadily rising due to increased consumption of electronics. However, only approximately 25% of this waste was processed through formal recycling channels. The formalization and expansion of this sector present significant employment potential. The International Labour Organization (ILO) estimates that globally, better waste management and recycling practices could create 6 to 20 million new jobs by 2030, with a major

share in developing countries.

Repair services represent another vital component of green employment. By extending the life of electronic and electrical goods, the repair sector reduces the volume of discarded items and delays the need for new production, which often involves high energy and material inputs. Repair technicians, mobile service centers, and local workshops contribute not only to waste reduction but also to affordability, especially for lower-income communities. In India, the informal repair economy employs thousands, particularly in urban and peri-urban areas. For instance, mobile repair markets such as Delhi's Gaffar Market or Kolkata's Chandni Chowk support hundreds of skilled and semi-skilled workers, many of whom come from marginalized backgrounds. Encouraging certification and skill development in this sector through schemes like Skill India can further enhance the quality and reach of repair services, thus generating formal employment while strengthening the culture of maintenance.

Innovation, meanwhile, drives the evolution of green jobs by introducing sustainable technologies and business models. This includes the development of modular product designs, eco-friendly manufacturing processes, digital platforms for product lifecycle tracking, and startups working on upcycling and materials recovery. Globally, countries like Germany and the Netherlands have integrated innovation-led green jobs into their national employment strategies, especially within the context of the European Green Deal, which aims to make Europe climate-neutral by 2050. In India, emerging enterprises like Attero Recycling and Karo Sambhav are innovating in the field of e-waste management by using advanced recovery technologies and closed-loop systems. These firms not only contribute to environmental goals but also create high-skill jobs in engineering, data analytics, supply chain management, and environmental compliance.

The significance of these sectors goes beyond environmental protection. They address the broader goals of social welfare and economic inclusion by generating jobs that are accessible, skill-building, and sustainable in the long term. For communities that are often excluded from mainstream employment, such as women, youth, and workers in the informal sector, green jobs offer a pathway to economic stability and dignity. Moreover, these jobs resonate with the values of social work—community development, social justice, and ecological balance—by fostering work that improves both livelihoods and the environment. In conclusion, expanding green employment in recycling, repair,

and innovation can help India and other nations meet their environmental targets while simultaneously advancing inclusive economic growth. Public policies that invest in training, technology, and infrastructure for these sectors are essential to fully realize their potential in creating a just and sustainable future.

4. Social Work and The Circular Economy.

Social work holds a central place in advancing the goals of the circular economy by bridging the gap between environmental sustainability and social equity. Traditionally focused on promoting social justice, community well-being, and inclusive development, the role of social workers has now expanded to include active participation in ecological initiatives. By facilitating community involvement, raising awareness about environmental issues, and promoting skill development in sustainable sectors, social work contributes to making the transition to a circular economy more inclusive and impactful.

One of the key ways in which social work intersects with the circular economy is through education, training, and capacity-building programs targeted at marginalized and vulnerable populations. In many parts of the world, social workers are involved in designing and delivering vocational training in areas such as e-waste management, electronics repair, upcycling, and sustainable material handling. These programs not only equip individuals with the technical skills needed for employment in green sectors but also enhance their sense of agency and participation in ecological restoration. In India, initiatives under the Deen Dayal Upadhyaya Grameen Kaushalya Yojana (DDU-GKY) and Skill India Mission have introduced green skill development modules, helping rural youth access jobs in sectors such as renewable energy installation, organic farming, and waste segregation.

Globally, several innovative models are integrating social work with circular economy principles to promote both environmental and social outcomes. For instance, the Restart Project in the United Kingdom organizes community repair events, where individuals can bring broken electronics and learn to fix them with the help of volunteers and technicians. This model not only extends product lifecycles but also creates spaces for community learning and collaboration, aligning with the values of empowerment and inclusion. Similarly, in the Netherlands, the Westerpark Circulair initiative combines social reintegration with circular design by employing people with limited job prospects to work in reuse centers, repair shops, and sustainable construction

projects. These programs reduce material waste while offering stable, meaningful employment.

In India, organizations such as **Chintan Environmental Research and Action Group** are working with informal waste pickers to formalize their work, provide health and safety training, and integrate them into structured recycling programs. This not only enhances the dignity and income of waste workers but also strengthens the efficiency of urban waste management systems. By collaborating with municipal authorities and corporate partners, such programs demonstrate how social work can act as a vital connector between policy, industry, and grassroots action.

In Latin America, the *Reciclaje Inclusivo* (Inclusive Recycling) program, active in countries like Brazil, Colombia, and Peru, integrates waste pickers into formal recycling chains through cooperatives and public-private partnerships. Social workers involved in these programs provide support in organizing, negotiating contracts, and advocating for policy changes that protect the rights and livelihoods of informal workers. This inclusive model ensures that the economic benefits of recycling are shared fairly while contributing to resource conservation and waste reduction.

By embedding social equity into environmental action, social workers help ensure that the circular economy is not just an economic or environmental shift, but a societal transformation. They play a critical role in addressing structural inequalities that may otherwise exclude marginalized communities from green employment opportunities. Furthermore, social work contributes to shaping sustainable consumption patterns by encouraging behavioural change at the household and community levels.

In conclusion, the integration of social work into circular economy frameworks enhances the effectiveness and fairness of environmental transitions. By creating pathways for disadvantaged populations to participate in green sectors—such as recycling, repair, sustainable manufacturing, and renewable energy—social work strengthens both the social and ecological fabric of communities. As the world moves towards more sustainable models of development, the contributions of social work will be essential in building systems that are not only environmentally sound but also socially just.

5. Impact and Long-Term Sustainability

The adoption of circular economy principles in the management of electronic waste has the potential to bring about profound and lasting transformations across environmental, economic, and social dimensions. By shifting from a linear ‘produce-use-dispose’ model to a system that values resource efficiency, repair, and recycling, societies can mitigate the harmful effects of unchecked consumption and waste generation. The benefits of this shift are not limited to ecological outcomes—they extend to human health, employment, urban planning, and inclusive growth.

Firstly, circular approaches reduce environmental degradation by minimizing the need for raw material extraction and lowering the volume of waste that ends up in landfills or informal dumping grounds. This is especially important in countries like India, where urban waste accumulation contributes significantly to soil and water pollution. For example, the e-waste management initiatives in Bengaluru have helped reduce the amount of hazardous waste entering the environment by promoting partnerships between local authorities, formal recyclers, and community workers. These efforts have led to cleaner surroundings and reduced toxic exposure for informal waste pickers.

Secondly, these practices promote the efficient use of resources, ensuring that valuable metals such as gold, copper, and lithium are recovered and reintroduced into production cycles. In Japan, the Tokyo 2020 Olympic medals were crafted entirely from recycled metals sourced from discarded electronic devices, collected nationwide. This project exemplified how resource circularity can be scaled up into national initiatives, simultaneously fostering awareness and reducing environmental impact.

Thirdly, improved e-waste handling significantly enhances public health, particularly for those working in waste collection, dismantling, and recycling. In places where e-waste is informally processed—often through open-air burning or acid baths—communities face severe health risks. Introducing protective technologies, formal processing units, and training for safe handling can reduce these risks. In Ghana’s Agbogbloshie e-waste dump, one of the largest in the world, international partnerships have begun introducing safe recycling equipment and community health programs to counter decades of environmental neglect.

The circular economy also strengthens local economies by creating new streams of employment, entrepreneurship, and innovation. Small and medium enterprises (SMEs) play a crucial role in this process by offering services in repair, resale, recycling, and upcycling. In India, start-ups like Karo Sambhav and Reco have developed models that support traceable, accountable e-waste collection and processing, providing jobs for both skilled and semi-skilled workers, and bringing visibility and dignity to the sector.

Moreover, circular practices contribute directly to the achievement of several **United Nations Sustainable Development Goals (SDGs)**:

- **Goal 8 (Decent Work and Economic Growth):** Green jobs in e-waste management offer dignified employment, skill development, and economic inclusion, especially for youth and informal workers.
- **Goal 11 (Sustainable Cities and Communities):** By reducing urban waste and promoting local recycling infrastructure, cities become cleaner, safer, and more resilient.
- **Goal 12 (Responsible Consumption and Production):** Encouraging product reuse and materials recovery directly addresses unsustainable consumption patterns.
- **Goal 13 (Climate Action):** Recycling and repair reduce greenhouse gas emissions associated with mining, manufacturing, and disposal, contributing to climate mitigation efforts.

By linking green employment with sustainability and the goals of social work, societies can build systems that are economically viable, socially inclusive, and environmentally sound. When governments, civil society, and industries collaborate to embed circular principles into policy and practice, they lay the foundation for a future where development does not come at the cost of ecological stability or social equity. The long-term sustainability of these efforts depends on continued investment in green skill development, public awareness, infrastructure, and strong regulatory frameworks that support the transition to a circular economy.

6. Conclusion: Towards A Sustainable and Equitable Future.

The circular economy offers a powerful and practical framework for addressing the escalating challenge of electronic waste while opening new

avenues for employment through environmentally responsible activities. By promoting practices such as recycling, repair, and the development of sustainable technologies, it provides a pathway for minimizing environmental damage, conserving natural resources, and creating meaningful livelihoods. These green jobs not only reduce dependency on finite raw materials but also bring dignity and stability to workers, especially in underserved communities. They offer a model of growth that is regenerative rather than exploitative, one that values human potential and environmental stewardship in equal measure.

When these efforts are aligned with the values and practices of social work, their social impact is significantly enhanced. Social workers, by virtue of their close connection to communities, are well-positioned to facilitate awareness, skill-building, and participation in green sectors. Their involvement ensures that the benefits of the circular economy—economic opportunity, environmental protection, and community well-being—reach those who are most in need. Programs that train youth, women, and marginalized groups in repair and recycling not only equip them with practical skills but also foster a sense of inclusion and ownership in the broader movement toward sustainability.

Looking ahead, the realisation of a circular economy that is both just and effective depends on collaborative action across sectors. Governments must enact forward-looking policies that support sustainable business models, regulate waste responsibly, and incentivize innovation. Educational institutions must incorporate environmental literacy and green skills into mainstream curricula, ensuring that the next generation is prepared to contribute to sustainable industries. At the same time, investments in green infrastructure—such as certified recycling facilities, e-waste collection hubs, and repair centers—are critical for scaling up the impact of this transition.

There is a genuine reason for hope. Around the world, communities, entrepreneurs, and institutions are beginning to embrace circular principles and embed them into everyday practices. From mobile repair cooperatives in rural India to electronics recycling start-ups in Europe, these efforts demonstrate that change is not only possible but already underway. With continued commitment, shared responsibility, and a focus on equity, it is possible to build a future where economic development does not come at the cost of environmental degradation—and where every discarded product can become the starting point for something new, valuable, and sustainable.

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CHAPTER – 2

A STUDY ON THE ANCIENT GURUKUL SYSTEM: AN URGENT NEED TO IMPLEMENT IN THE MODERN EDUCATION SYSTEM

SAPTAPARNI RAHA

Doctoral Research Scholar, School of Law, Brainware University

Dr TAMAL GUPTA

Assistant Professor, School of Law, Brainware University, E-mail ID: tamalgupta13@gmail.com

Dr JOYDEB PATRA

Assistant Professor, School of Law, Brainware University, E-mail ID: joydebajoy@gmail.com

1. Introduction

The Gurukul system of education existed in ancient times. Students lived at their guru's place and learned various subjects, which they could later use to solve real-life problems. A strong emotional bond between the guru and the shishya was essential before the teaching and learning could begin. The guru

taught a wide range of topics, including religion, Sanskrit, scriptures, medicine, philosophy, literature, warfare, statecraft, astrology, history, and more. Learning involved more than just reading books; it required connecting ideas to the natural world and life experiences. It was not about memorizing facts and figures to pass exams. Education was based on the Vedas, the rules of sacrifice, grammar, derivation, understanding nature, logical reasoning, science, and the skills needed for a job. The ancient education system in India recognized that the ultimate goal of life is self-realization. It was unique in many ways, as society did not interfere with the subjects studied, regulate fees, or dictate the hours of instruction.

2. Subjects Taught in Gurukul System

The Gurukul system in ancient India taught various subjects, such as astronomy, medicine, philosophy, political science, economics, religion, yoga, physical education, defense studies, Vedic literature, Sanskrit, mathematics, and other traditional Indian sciences. This system focuses on practical knowledge, overall development, and passing knowledge and culture from one generation to the next. In addition to academic subjects, the Gurukul system emphasizes extracurricular activities like sports, yoga, and the arts, which are seen as essential to a well-rounded education. The system relies heavily on teachers, who manage the curriculum, teaching methods, and assessments. Learning is customized to fit each student's needs rather than following a general curriculum. The Gurukul system's focus on individual attention, practical knowledge, and overall development has influenced the modern education system in India and beyond.

3. The Role of Group Discussions in The Gurukul System

Group discussions are vital in the Gurukul system. They enable students to learn from one another and develop critical thinking, practical knowledge, and analytical skills. Some key aspects of group discussions in this system include:

1) Teachers often interact face-to-face with students, and group discussions are a regular part of the learning process.

2) The Gurukul system categorizes students by age: Vasu for those up to 24 years old, Rudra for those up to 36 years old, and Aaditya, also for those up to 36 years old. This structure supports age-appropriate group discussions and activities.

3) These discussions serve as a way to teach important content in subjects like languages, science, and mathematics.

4) The Gurukul system values arts, sports, crafts, singing, and other extracurricular activities that enhance students' intelligence and critical thinking skills.

5) Students learn the importance of honesty, compassion, and self-control, and group discussions help foster these values.

By integrating group discussions into its teaching methods, the Gurukul system promotes active learning, critical thinking, and the growth of essential life skills.

4. Modern Education System in India

The issue of quality of Higher Education in India cannot be understood without digging into the past. Historical records reveal that in 1916-17 there were only four engineering colleges in India with total annual intake of 74 students. The growth of the number of institutions of higher education was slow until Independence. After Independence, Higher education became one of the crucial agendas of the newly formed government. They realised that the development of our nation depended immensely on building the human capital by providing them with good quality education. Our first Prime minister advocated the scientific approach, the scientific outlook and the scientific temper. He had an inherent fascination not only for science but also for what he termed the scientific temper which he described as, "search, inquiry and applying your mind to it...and search by experience and reasoning...It is a way of training the mind to look at life and the whole social structure." [2] He intended to imbibe these ideals of rationality and social responsibility into the people through education so they may evolve into responsible citizens who may use their skills for the welfare of the nation. With this aim, the first Prime minister of our country made enormous contribution to the development of various institutes of Higher education especially those focusing on technical and managerial skills. He wished to make these institutes' world class centres of research and learning.

The public expenditure on Higher Education in India had continuously increased from Rs 171.5 million in 1950-51 to Rs 95,620 million in 2004-05. It had a good growth rate in the 1960s. The funding slightly decreased in the 1970s and improved again in the 1980s. The extent of public expenditure on any item can be taken as an indicator of the priority which the government gives to it. Under the pressure from various international funding agencies, the subsidies allocated for higher education were diverted towards the development of

primary education as it was argued that investment in higher education benefits only a tiny section of the population whereas primary education would provide leverage to a wider section of the population. Privatization of Higher education took place following this drastic reduction in the state funding. Statistical information, reveals that in 2002, 78.2 percent of engineering and technical colleges and 71.3 percent of medical colleges were in the private sector. These private institutes mushroomed mainly to fulfil the huge demand for professional courses such as engineering, medicine, law and management. The number of universities went up from 20 in 1947 to as high as 659 in 2011, and a similar trend was observed as the number of colleges increased from 500 to 33,023.

5. Challenges Faced by The Modern Education System

The modern education system has greatly expanded and gone digital in recent decades, yet it still faces structural and functional challenges that impact its quality and inclusiveness. One major issue is the focus on rote learning and exam-oriented teaching. This traditional method promotes memorization rather than conceptual understanding, which limits creativity and analytical skills. According to the Annual Status of Education Report (ASER 2023), a large percentage of students in rural India struggle with basic reading and math skills, exposing significant learning gaps (ASER Centre, 2023). Another challenge is the shortage of practical and skill-based education. Even though the National Education Policy (NEP) 2020 emphasizes the need for skill integration, many institutions still rely on content-heavy, theory-based curricula. The India Skills Report (2023) shows that only about 50% of graduates are employable due to a gap between what is taught and what employers need (Wheebox & AICTE, 2023). Additionally, many teaching methods remain outdated. Traditional lecture-based approaches are common, while interactive and student-centered techniques are less frequent. The National Achievement Survey (2021) found that classroom engagement is mostly passive in many government schools, which limits effective learning (NCERT, 2021). The use of Information and Communication Technology (ICT) varies widely by region, with rural areas facing significant technological barriers. A pressing concern is the digital divide and unequal access to education. During the COVID-19 pandemic, private urban schools switched to online classes, while over 60% of children in rural India lacked access to digital devices and internet connectivity (UNICEF India, 2021). This has widened educational gaps across different regions and income groups. Poor infrastructure in government schools remains another ongoing issue. A 2022 report by the Unified District Information

System for Education Plus (UDISE+) showed that around 15% of schools still do not have electricity, 25% do not have functional libraries, and many lack gender-segregated toilets (UDISE+, 2022). This impacts girls and marginalized communities the most. The curriculum and syllabus in many institutions are often outdated and do not align with 21st-century skills such as digital literacy, environmental awareness, and innovation. According to NEP 2020, there is a strong need to update the curriculum to ensure it is relevant, flexible, and multidisciplinary (MHRD, 2020). Teacher quality and support are also vital issues. Many teachers are underqualified or not well-trained. Most states lack ongoing professional development. The National Institute of Educational Planning and Administration (NIEPA, 2022) reports that low teacher motivation and insufficient support hinder classroom performance and student outcomes. Students' mental health and emotional well-being are becoming urgent concerns in modern education. Academic pressure, competition among peers, and high parental expectations have led to growing cases of stress, anxiety, and even student suicides. The National Crime Records Bureau (NCRB, 2022) noted a worrying increase in student suicide cases, underscoring the need for psychological counseling and life skills education. The privatization and commercialization of education have also added to the rising inequality. With more private schools and coaching centers, education is being viewed more as a market product. This undermines the constitutional vision of fair and quality education for everyone (Kumar, Krishna, *What Is Worth Teaching?* 2007). The assessment and evaluation system relies heavily on high-stakes board exams, which are often criticized for encouraging rote learning and exam stress. NEP 2020 suggests reforms in assessment systems for a more holistic and formative evaluation, but progress remains inconsistent. Moreover, value education and ethical learning are often overlooked in modern curricula. Ancient Indian systems emphasized moral and spiritual growth, but today's system falls short in fostering compassion, discipline, and civic responsibility in students (Altekar, A.S., *Education in Ancient India*, 1934). On the administrative side, poor policy implementation and bureaucratic slowdowns hinder progress. For example, despite the ambitious goals of the RTE Act 2009 and NEP 2020, many schools have not met the required standards for teacher qualifications and student infrastructure (MHRD, 2020). Another structural problem is the weak connection between industry and academia. Most Indian graduates lack sufficient opportunities for internships, research, or skill training. According to NASSCOM (2022), only 46% of Indian engineering graduates are employable because they lack real-world experience. Lastly, research and innovation in Indian higher education are underfunded and undervalued. The

World University Rankings (2024) reveal that few Indian universities rank in the top 200 globally for research output, signaling a need for increased investment in R&D and academic independence (Times Higher Education, 2024). In summary, while the modern education system has made significant strides in access and literacy, it still struggles with equity, relevance, quality, and adaptability. Addressing the digital divide, reforming teaching methods, improving infrastructure, supporting mental health, and aligning education with national development goals are crucial for making education truly inclusive and transformative.

6. Comparative Study Between Gurukul System and Modern Education System

The modern education system was introduced in 1835 by Lord Macaulay, based on a British model. This system has led to discrimination based on race, gender, and caste in Indian society. Today, many seats in schools, especially at the university level, are reserved for backward classes. This situation has caused many students to leave India for higher education abroad. The entrance exams for university are often unfair. For example, a student who wants to pursue a Master's in History may have to take an exam that includes Mathematics. This mismatch makes no sense. A student aiming to study Public Policy may face an entrance test unrelated to their field. Many students miss out on opportunities because we evaluate them based on school and college marks. These grades, which aren't linked to job performance, dictate their careers. In classrooms, one teacher handles about 50 students. After teaching, the teacher leaves, and whether the students understood the material doesn't seem to concern them. Students learn theories that don't hold much value in real-world applications. More than half of what we learn in school lacks relevance to our lives. We aren't taught anything innovative; we memorize theories and regurgitate them on tests. Our grades, based on rote learning, shape our futures, which is why many educated youth remain unemployed. The education system fails to provide practical experience. Another significant issue is that 90% of our young people know little about Indian culture and its glorious past. History books focus on events like the World Wars and British colonialism, while our rich heritage often goes ignored. Foreign students come to India for cultural exchange programs, to study manuscripts, and even learn Sanskrit. Yet, how many people in India can speak the language? How many have read the Ramayana or Mahabharata, or understand the principles of Kautilya? Indian textbooks are filled with stories by Shakespeare. The education system includes both private and public schools. In private schools, English is the medium of instruction, while government

schools typically use Hindi, or another state language, as India recognizes 22 languages. A major problem is the English language; only 30% of Indians are fluent in it. The remaining 70% do not speak English, and Hindi is the most commonly spoken language, followed by Bengali. This reliance on English has negatively impacted many people's futures. India is a poor country, with most people living below the poverty line, who can't afford private school tuition. Even if individuals have great ideas and skills, the inability to speak English can hinder their progress. Most high-profile jobs require English proficiency. Why should all Indians need to learn a foreign language like English?

7. Conclusion

India has a rich history of valuing education and learning. People from Europe, the Middle East, and Portugal came to India seeking better educational opportunities. The Gurukul Method was a prominent education system in ancient India. It covered various subjects, such as Sanskrit, Scriptures, logic, and metaphysics. Knowledge and insights from this system were passed down through generations. However, during the Colonial period, the British established schools that offered a limited curriculum focused on subjects like science and mathematics. The traditional system emphasized outdoor activities, while the new approach emphasized academics. Activities like yoga, meditation, and singing promoted positivity and contentment. Regular tasks were often completed independently to provide practical knowledge. The main goal of the Gurukul system in Indian education is to help children understand what it means to lead a prosperous life. This belief in harmony should be taught to children early on so they can make informed choices about work, rest, exercise, and how they want to live their lives.

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CHAPTER- 3

REVIVING ANCIENT PEDAGOGIES - THE GURUKUL SYSTEM IN MODERN EDUCATION

ADVOCATE ABHISEK GHOSH
(High Court, Calcutta)

Department of Law, Brainware University, Kolkata, West Bengal
700125, India. E-mail: info6412@gmail.com

1. Introduction

Education is the most important thing for both personal and national growth, everyone says. It's possible that the lesson and the way it's taught are still not the same thing. Because they have different ideas, attitudes, and goals, each group is different from the others. Schools have come a long way in the past few years, but they still have a long way to go. Because they have to remember things, worry about how well they do on tests, and see school as a chore, they don't feel linked to it. They don't learn how to get better or how important morals are. There is a problem with the system as a whole when people are stressed out, have mental health problems, or have trouble getting work even with a degree.

To get their drive and sense of balance back, more and more people are going back to the old ways of learning. One great example of this idea is the Gurukul way of teaching. It was very important to the people of India during and after the Vedic time. This was more than just a school; it was a spot to learn. It was a way of life. Both the teachers and the students believed that learning was an important part of daily life and that character building was just as important as learning.

This part isn't about seeing the Gurukul system as something old that doesn't exist anymore. Instead, it wants people to see it as a source of ideas that can be used effectively in situations that are important to learning today. We can think of education as a process that changes people and supports moral behavior by looking at its historical roots, comparing them to modern institutions, figuring out how relevant they are now, identifying problems, and coming up with new ways to deal with them.

2. The Gurukul System – Historical Roots and Philosophy

2.1 Where it originated and how it functions in the world

The Gurukul system was established at the same time that the Vedas were written, which was approximately 1500 BCE. The term "Gurukul" is derived from the words "guru," which in turn means "teacher," and "kul," which can be translated as "home" or "family." Gurukuls were typically located in ashrams or in the forests, and pupils, known as shishyas, resided with their teachers during their time there. The way that public schools operate in the modern era is not like this. To phrase it another way, education was all-encompassing, lived-in, and an extremely personal experience.

In many cases, the first thing that had to be done in order to gain entry into a Gurukul was to perform the sacred ceremony of upanayana, which signified the beginning of each child's formal education. Students from all over the world lived together, worked together, assisted the guru, and put forth a lot of effort in their academic pursuits. It was not enough to simply read books; other requirements included adhering to norms, being responsible, and maintaining discipline.

2.2 Courses and Instructional Strategies

Within the framework of the Gurukul system, a wide variety of classes were offered to students. The Vedas and other holy writings were the primary subjects that the students studied; however, they also mastered physics,

mathematics, language, music, martial arts, politics, and ethics in addition to these subjects. Students gained knowledge in a variety of practical areas in addition to academic courses, including how to work, how to care for animals, how to construct things, and how to stay alive. It was because of this that individuals were prepared for life beyond school and for the workforce.

2.3 Varieties of Instructional Methods

During their time at Gurukuls, the students engaged in activities such as reciting, talking, disputing, memorizing, and asking questions. Not only was it about acquiring knowledge, but what was more important was really accomplishing things. It was recommended that pupils learn by repeatedly practicing what they had already learned, thinking about what they had learned, and doing what they said they had learned. As a guide, mentor, and moral advisor, the guru's role in the process was an extremely significant component of the overall procedure.

Teaching Vidya, also known as education, at the Gurukul consisted of more than merely memorizing facts and figures, according to the students' thoughts. On top of that, it was a method for discovering who you are. The objective was to assist individuals in developing in all aspects of their lives, including their minds, bodies, morals, and spirits. The importance of being taught values such as respect for adults, discipline, service, and living in harmony with nature cannot be overstated.

The Gurukul was a method of instruction that was designed to complete a person so that they might bring about change in their own lives, as well as in the lives of their colleagues and their families.

3. Modern Education and The Gurukul Contrast

3.1 Facts About Schools

Today, Colonization, industry, and globalization have made most of modern education structured, standardized, and focused on credentials. It has a lot of good things about it. It has sped up research and technology, made it easier for many people to learn, and given people new ways to go about and find good work. There are a lot more people who can read and write now that there are more schools and colleges.

But this method does have certain problems. People often put creativity and critical thinking ahead of grades, memorization, and mechanical evaluation. A

teacher-student relationship is not the same as having a guide. It looks more like a commercial deal. People don't care about morals or values; getting a job is the most essential thing.

3.2 Ways to Compare

The Gurukul is different from other places in a number of ways:

- **Teacher-Student Bond:** The guru was a moral guide, a teacher, and a parent figure in a Gurukul. Gurukuls taught a mix of theory, science, and practical skills. Most of the time, teachers in today's schools are only guides who have to follow a set timetable and curriculum. Modern courses, on the other hand, tend to break up subjects and focus more on skills that may be used in the job market.

- **Assessment:** Gurukuls put more emphasis on practice and personal growth, while modern systems mostly use examinations and assessments from outside sources.

- **Values:** The Gurukul's education was based on respect, simplicity, and service. In modern institutions, on the other hand, learning is all about being competitive and doing well on your own.

3.3 The Missing Link

Schools nowadays have had a hard time teaching all parts of human growth, but they are quite good at teaching science, technology, and how to get along with others. The Gurukul way of life can help you live a more balanced life. It makes something better instead of replacing it by bringing back values, mentoring, and life skills.

4. Relevance of The Gurukul Pedagogy in Contemporary Times

4.1 Life Skills and Comprehensive Learning

One of the most crucial things we need right now is education that teaches us how to be resilient, caring, responsible, and strong. Living in the Gurukul, where they were responsible, self-sufficient, and frugal, taught the students these qualities. A lot of young people are under stress and are unsure of how to handle it. The Gurukul approach aids in their acquisition of critical abilities.

4.2 Students and teachers assisting one another

With dozens or even hundreds of kids in a classroom these days, it might be challenging to assign a unique mentor to each student. Gurukul advocated for

a tight, almost familial relationship between the guru and the shishya. If this type of mentoring resurfaces in the shape of guidance cells, smaller groups, or one-on-one assistance, students can resume communicating with one another.

4.3 Integrating faith and values

The Gurukul attempted to teach religion and values in addition to education; it was not a value-free institution. In an increasingly violent, corrupt, and isolated society, it is critical to teach civic responsibility and character in a way that makes sense. The Gurukul concept aligns with the inclusion of yoga, meditation, and morality courses in the curriculum.

4.4 Being environmentally conscious and taking care of the planet

At Gurukul, we spent a lot of time outside. The children learned to live modestly and to respect nature from their teachers. Schools can use this concept to teach people how to take care of the environment and live in a way that is healthy for it, especially now that it is in danger.

4.5 Contemporary Experiments and New Gurukuls

Some Indian schools are already attempting to revive the Gurukul's concepts today:

Both traditional and modern concepts are taught in Chinmaya Vidyalayas and Dayananda Anglo-Vedic schools. The Rishi Valley School, which combines formal education with leading a holistic life, was influenced by Jiddu Krishnamurti. Both Vedic and contemporary subjects are taught in gurukuls, which are administered by religious organizations. These examinations demonstrate that, with proper modification, the Gurukul model can be used with CBSE, ICSE, or UGC systems.

5. Challenges, Critiques, and The Way Forward

People are once again paying a lot of attention to the Gurukul system in the twenty-first century. This has led to new conversations in schools, communities, and politics. There were a lot of great ideas in there, like teaching the whole person, having teachers mentor students, and learning based on concepts. We need to understand their problems if we wish to fix them or change them to fit the current situation. To make integration work in schools today, we need to know what the problems, chances, and dangers are.

5.1 Bad things that happen during rebirth

There are several reasons why it would be hard to bring back the Gurukul system, such as social, practical, and institutional ones. This is still true, even if it fits with the present drive for all-around education.

- **Getting in touch with and including everyone**

One of the most important things to do is to get everyone involved. Many Gurukuls used to not let women in, those from lower social groups, or people who lived in poor areas. It's not typical for anyone to be banned from school these days because everyone should be able to go. For Gurukul-based schools to work well in today's world, these difficulties need to be fixed on purpose. They can do this by campaigning for women's rights, fair economic conditions, and easy money. People might think the model is looking back instead of forward if these changes aren't implemented.

- **How to Tell the Difference Between Customization and Individualization**

Traditional approaches and one-on-one learning don't always work well together. Most of the time, the Gurukul method was one-on-one teaching. The teacher would change the lessons to match each student's needs, interests, and way of learning. Schools now follow national curricula and tests, though, to make sure that students learn and reach certain goals. Pedagogical paradoxes arise when individualized teaching methods and student accountability for their work are at odds. Even though kids need to take care of themselves, many of them still have trouble doing so.

- **Things youngsters should know**

Today, everything is quite competitive and focused on work. A lot of parents believe that school is the best method for their kids to do well in life. It's really important to them that kids learn how to work, study for tests, and get good grades so they can go to college. People don't usually think that value-based or inclusive projects are important or useful, yet they can be. It can be hard to convince parents and teachers of the importance of building moral foundations, character, and resilience.

- **Problems in cities**

It can be hard because most kids these days live in cities. In the past, students who lived with their gurus in peaceful, natural places like ashrams or forests helped gurukuls. It's hard to make these kinds of communities these days

because land is expensive and hard to get. Because of this, a lot of people, especially those who reside in cities, might not like the idea of a full-fledged Gurukul.

5.2 Dangers of Increasing Commerciality

There are several problems that need to be fixed before the Gurukul plan can be disseminated, which makes it more dangerous.

- **Branding on the surface of products**

A lot of groups and businesses have been called "modern Gurukuls" in the last few years. A lot of these people are more interested in the system's uniforms, ceremonies, and older architectural styles than in its philosophical and educational roots. As a result, the Gurukul turned into a business instead of a place to learn life skills and values.

- **The past has come to the present.**

A lot of people romanticize the Gurukul system and don't think about its flaws. The planet was completely shut down, it was hard to replace the buildings, and the restrictions were very strict. But it did teach discipline, rules, and character. It is wrong to use the Gurukul as an example in history and in teaching. Romanticizing tradition may hide its flaws. This could result in improvements that don't work because they don't take into account how schools are now run.

- **Forms that never change**

There were strict gurukuls at my school that made students follow the rules without thinking about them. If not challenged, this rigidity may be at odds with democratic values, student independence, and the modern education system's focus on critical and creative thinking. So, we need a smarter way to keep the best parts of the Gurukul system while getting rid of the parts that go against modern ideas of freedom and equality.

The Gurukul may become something else if it is rebuilt for sentimental or financial reasons. Businesses should try to use the ideas instead of merely declaring they agree with them.

5.3 Institutions and Policies' Role

Institutions must change and new rules must be made in order to appropriately incorporate Gurukul ideals into modern education.

What NEP 2020 Does: India's National Education Policy (NEP) 2020 is a great example of how to mix old and new ideas. Gurukul's ideals are in line with NEP 2020's focus on values, learning via experience, and personal growth. The Gurukul's purpose is to prepare students for more than just tests, hence it focuses on teaching them life skills instead of a lot of data.

- **Help and advice for teachers**

Teacher training is one of the most important parts of regeneration. The master of a Gurukul was more than just a teacher. They also acted as spiritual guides, teachers, and examples for others. We need to change how we train teachers so that they are ready for problems like these. Values-based education, meditation, yoga, mentorship, and taking care of the environment should all be part of training programs. Teachers should be encouraged to mentor kids outside of class to help them become stronger, smarter, and more aware of other people.

- **Changes to the curriculum**

The program should take into account all important elements. In addition to STEM fields, civics, yoga, ethics, and environmental conservation should be given more importance. This helps kids grow up to be good citizens and workers. Public schools can use "combo models" like Gurukul's as long as they don't break the law. These models can include mentorship groups, community service, and project-based learning.

- **Paths in Public Places**

A lot of Indian schools already use different ways to teach. The Chinmaya Vidyalyayas, the Rishi Valley School, and the Dayananda Anglo-Vedic schools are some such examples. These programs show that formal education may work alongside value-based learning and a whole-person approach to life. If the government gives them the right training and support, these models could help spread Gurukul-based practices.

5.4 The Repercussions

A lot of individuals still don't agree on what would happen if Gurukul ideals were reintroduced back into modern classrooms.

- **Instead of replacing, you should employ blended learning.**

The Gurukul system won't fully change how we teach currently. In the

future, Gurukul's direction, aims, and all-around growth approach should be blended with the speed, diversity, and technology of modern education. This method takes into account both stability and change.

- **Mentoring programs**

One nice thing that could come from this is that the government could start mentoring programs. Teachers could get small groups of pupils together to talk about matters other than schoolwork. These chats could be about things like how to deal with moral difficulties, how to grow as a person, and how to live a good life. This form of engagement brings back the crucial bond between teacher and student that is part of the Gurukul system.

- **Getting information via doing things**

Because of this, a lot of schools now require their students to perform projects that are useful in the real world. Students at Gurukul learn by doing things that require them to work together, be independent, serve others, and take care of the world. Environmental protection projects, community service programs, and group activities that help people solve problems might all be part of normal school.

Gurukuls that you can read on the web: Digital Gurukuls use technology to let people learn and acquire a full education from anywhere. It's easy to talk about ethics and sustainability, do yoga and meditate online, and talk to other people in the digital age. This could make the old way of life more significant.

- **Improving the teachings**

People are taught subjects like social responsibility, philosophy, meditation, and how to take care of the environment. Because of this development, schools would teach things like values, being ready for work, being a good citizen of the world, and mental health.

- **The possibility that things will improve**

How much of a difference this rebirth makes will depend on how well we see education as a way to get ready for life instead of a way to generate money. Students can learn to find a balance between knowledge and wisdom, cooperation and competition, purpose, and integrity by using Gurukul ideals in modern classrooms.

It is not easy or evident how to bring back the Gurukul system. A lot of

consideration needs to go into marketing, setting city limits, and what parents want. The NEP 2020, digital platforms, and hybrid learning environments all demonstrate that selective adaptation is feasible and beneficial. Without being dogmatic or restrictive, it's hard to give a thorough critique of the Gurukul system that focuses on its principles, recommendations, and living a fulfilled life. It would be fantastic if schools and governments could agree on a way to teach kids the skills they need to be good people and professionals, as well as the empathy and toughness they need to be happy.

6. Conclusion

The Gurukul system has been around for a long time, yet the principles it teaches are still valuable now and in the future. It displays a manner of teaching where learning is a part of life, facts are connected to values, and the way a teacher interacts to a pupil is very real. Modern education is great at science and easy for many people to receive, yet it has become more automated and promoted. Ethics, sustainability, discipline, mentoring, and holistic growth are all things that Gurukul teaches us that help us go back to equilibrium. It's not about missing the good old days to bring back old ways of teaching. It's about giving students an education that gets them ready for life and job. If you apply the Gurukul spirit correctly, you might be able to make a school system that helps kids grow in both their skills and their character. People will be able to get along with themselves and the world, and society will actually transform.

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CHAPTER - 4

ARTHASHASTRA REVISITED – ETHICAL GOVERNANCE IN THE EDGE OF GEOPOLITICAL TURBULENCE

ADVOCATE ABHISEK GHOSH

Department of Law, Brainware University, Kolkata, West Bengal
700125, India, E-mail: info6412@gmail.com

ADVOCATE ANURADHA CHAKRABORTY

Department of Law, Brainware University, Kolkata, West Bengal
700125, India, E-mail: anuradhachakraborty126@gmail.com

1. Introduction - Revisiting the Arthashastra in the 21st Century

Since the dawn of time, people have been attempting to figure out who should be in charge and how to wield that power. Leaders and philosophers have always tried to establish a middle ground between what people need and what is right, between what is ideal and what is true. This has always been true, even in the old Greek capital cities and the imperial palaces of China and India. Kautilya's Arthashastra is one of the few works from this very old school that

has been as important and long as it has been. People commonly think of this book, which came out about the third century BCE, as a compendium of ideas about how to run a government, deal with other people, run an economy, and fight a battle. It advises rulers how to run their kingdoms, keep them rich, and use their power wisely.

The world is changing in ways we've never seen before in modern times, though. The international order is becoming less stable because of things like the emergence of multipolarity, the rise of conflicts between major countries, the expansion of technology, the hazards of climate change, and the constraints of global administration. Ethical government is the belief that persons in authority should utilize it ethically, fairly, and with regard for the well-being of others. It seems like this ideology is under more and more danger. People often don't know what to think about themselves since governments switch between harsh truths and symbolic gestures of goodness. The Arthashastra can help us think about this topic in a different approach. People argue that the book is about brutal practicality, but if you examine more closely, it's not. It's more about keeping things in order, keeping people safe, and the ruler's duty to the people. Kautilya understood that lying, spying, and force were real, but he put them in a way that was aimed to safeguard the state and the prosperity of its people.

This chapter attempts to reevaluate the Arthashastra, not merely as an antiquated text, but as a repository of ethical governance principles applicable in a chaotic global context. By examining its concepts, juxtaposing them with contemporary ethical theories, and applying these ideas to address current geopolitical issues, we may discover methods to reconcile pragmatism with morality. We will look at the core notions of government in the Arthashastra, then the moral principles that support them, and finally how we might employ what we've learned from the Arthashastra in present times. The Arthashastra asserts that ethics and statecraft don't have to be at war with each other. They can, on the other hand, be under constant tension. Leaders are having a hard time balancing power with morals, therefore it's crucial to keep this in mind. We can establish a moral government that is ready for the challenging times we are living in today by following good ideas like this.

2. The Arthashastra's Foundations of Governance and Statecraft

The Arthashastra was written by Kautilya, who was also known as Chanakya

or Vishnugupta. He lived during the Mauryan era. It was a complete guide to being a king, running a government, and diplomatic relations. It was different from other philosophical works because it mixed moral principles with practical advice. It gave rulers a guide on how to run a country well.

The Framework of the State He talked about the "seven limbs of the state," which he called the Saptanga. These things were the king, the ministers, the allies, the treasury, the land, the defenses, and the army. All of these parts must be strong for a state to exist. The king was the most important person, and he had power because he could make sure everyone was happy. The army protected the country, the officials gave advice, and the territory brought in money. In the bigger geopolitical order, friends decided whether a kingdom would live or die. The treasury paid for both welfare and war, and fortifications kept sovereignty safe.

- **What the King Does**

What the people thought of the king was more like a trustee than a dictator. He said, "The king's happiness is in the happiness of his subjects; the king's welfare is in their welfare." This term makes it clear that the administration's main goal is to improve the lives of the people. He knew that the monarch had to be practical, though, and that lies, punishment, and even spying were all fine as long as they kept things stable.

- **The government and money**

The Arthashastra put a lot of emphasis on making and giving money. People thought that farming, trade, irrigation, and taxes were all very important to the security of the state. Kautilya wanted fair taxes that weren't too harsh or too easy on people. Having a strong economy was important for security and authority.

- **How Mandalas Work and How to Be Diplomatic**

The Mandala, which is the Arthashastra's idea of foreign policy, may be its most important lasting addition. This idea says that states that were close to each other are naturally unfriendly, while states that are farther apart might be friendly. Instead of being set in stone, alliances and rivalries were fluid and could be adjusted as interests changed. The Mandala theory showed a realistic view of international politics in which survival was more important than morals.

- **Secrets and keeping things safe inside**

A lot of books were written by Kautilya about spying, information networks, and surveillance. Spies were used in war, but they were also used to keep an eye on government officials, stop corruption, and put down uprisings before they started. Even though this might seem mean, Kautilya justified it as necessary for stability and to keep bad things from happening.

The Arthashastra gives a complete plan for running the government. It blends moral responsibility with practical statecraft. Not just a guide to lying, it's also a way of thinking about how to run a government that takes into account how weak people are, how conflict is inevitable, and how to find a balance between morals and practicality. In this complex view of the world, morality, and reality live together in a precarious balance.

3. Ethical Governance in Classical Thought and Modern Interpretation

Many individuals don't agree on whether the Arthashastra has a decent moral point of view or only clings to logic. To comprehend the moral implications, it is essential to examine the distinctions between these concepts and contemporary notions of effective governance, as well as their similarities to prevalent governmental conceptions.

- **The ethical principles of the Arthashastra**

Kautilya got his power from the principle of rajadharma, which asserts that people owe something to the sovereign. No one monitored other people or forced them to do things to acquire what they desired. They performed these things to maintain things in order, make sure everyone was pleased, and keep the people in control safe. He could have done two things better. He talked about people's health; thus, the government should care about more than simply its own aims.

Kautilya doesn't agree with the ideas of artha, dharma, and niti. Niti stands for policy, while artha stands for riches. People who worked for managers but didn't help would lose their jobs. If a king or queen didn't care about what was good and bad, they would lose their power. So, in the long run, finding a medium ground was the best thing to do.

Nick Machiavelli researched different countries before writing *The Prince*. These are some of its good points: Machiavelli said that leaders should be good individuals, even if they want to do wicked things. Kautilya, on the other hand,

pondered about more than just the time. Their opinions are the main reason they don't agree. Kautilya said that a ruler's power depended on how well his people were doing. Machiavelli, on the other hand, wants to be in charge of everything.

Confucius emphasized that moral norms must always be followed. He believed that these sections of the government were the most significant. Kautilya, on the other hand, stated that leaders should employ both morals and violence to stay in power.

The primary premise of utilitarianism is to do what is best for the most people. John Rawls and other liberal thinkers claim that fairness and justice are the same thing. A realistic utilitarian ethic emphasizes that everyone's health and safety are vital, but when there is risk, their safety and life should come first. This way of thinking about right and wrong aligns well with Kautilya's thoughts.

- **The Arthashastra discusses ethics.**

We could reflect about the good and bad things about the world today if we read some of the Arthashastra. Is it a good idea to keep a lot of people safe? People like this are looking about and watching. The king or queen answered, "Yes, as long as things didn't get worse." This is still a topic of conversation when people talk about government spying and data security.

- **Threats and bumper stickers:** The Arthashastra advises that one method to motivate someone to act better is to punish them harshly. It goes against everything we believe about human rights today, even if it works. They don't see eye to eye.
- **Business ethics:** Kautilya believed that taxes and rules should be fair and that no one should be treated unfairly. There are still issues like bribes, unfair marketplaces, and income that isn't equitable.

- **How people feel about moral government at this time**

These days, the fundamental ideals that guide government ethics include being honest, fair, and responsible, and including everyone. We should know how to wield our power and respect it. All of these norms say that the monarch should do what is best for the people. Kautilya's rules may seem harsh, but they fit with these ideals.

Heads can read the Arthashastra again to understand how to be nice and do the right thing. Finding the appropriate balance between what needs to be done and what is right can be hard. The government needs to be careful not to tarnish its own image when it seeks to fix real problems. Kautilya didn't make people more negative; instead, he established a paradigm that showed how ethics and practicalities may work together.

4. Geopolitical Turbulence and the Crisis of Governance Today

The forecasts we now possess for the 21st century are, at best, imprecise. A lot of people were glad when the Cold War ended because it made the country more open. Its limitations are that it is sluggish and that it derives strength from numerous areas. The government is wrong, so someone needs to step in and make things right.

- **Countries that are really strong typically fight each other.**

When it comes to trade, research, or the military, the US and China don't get along. Because of this, firms that operate across borders and supply lines are fouled up, which makes it tougher for people to trust each other. Countries that are near to each other should stay on one course, whereas countries that are farther apart should try a few alternative ones. People have to do what strong people say if they want to stay alive, no matter what. This signifies that the government is now bad.

- **They have different ideals.**

Europe isn't as safe as it used to be when Russia attacked Ukraine. This has put both international law and the strength of each country to the test. When states make decisions, they should think about their values, their business aims, and their duty to safeguard the public. It's hard for government officials to do the right thing when people are competing for power. This is clear in the fight.

As the weather changes, we need to take care of the Earth. You need to find the quickest method to get there.

Climate change could be the most serious moral issue we face right now. A lot of evidence shows that governments put their short-term economic interests ahead of their long-term viability, but they still do it. He added, *"Bad things will happen when leaders don't care about the health and happiness of their people (and those who will follow them)."*

The internet and other technology are getting in the way. Digital technology has made everything better. Governments utilize tracking devices, cyber weapons, and artificial intelligence (AI) to fool and control their people. Some people use the internet to steal from others, spy on them, and invade their privacy. This is very wrong.

In the last few years, a number of areas have suffered worse droughts and more dictatorships.

As populist leaders erode long-standing institutions, more and more people around the world don't trust their governments. The end outcome is a society that is increasingly divided. They can limit people's rights, but they also protect them. The same issues that have caused problems for past administrations keep cropping up when people aspire to attain moral and political power. Problems happen when powerful people misuse their power. A lot of countries today have a hard time staying in power and staying alive. Always keep in mind that your safety depends on how good and healthy you are. You can be authoritarian when you are strong and can do things on your own. This is horrible for everything.

5. Relevance of Arthashastra in Contemporary Governance and Diplomacy

Even if the Arthashastra has a few shortcomings, it is nevertheless possible for people to gain a great deal of knowledge from it. Considering that it is now a collection of interconnected ideas, its value has increased.

Kautilya recommends that you should always be learning new things, planning ahead, and keeping an eye on the future. He also suggests that you should always be keeping an eye on the future. Despite the fact that pandemics, cyberattacks, and the reality that connections with other countries are constantly changing, it is still extremely important to plan ahead in order to successfully manage the government. In his advice to nations, Kautilya urged them to avoid repeating the same mistakes, which included failing to adequately prepare for the catastrophes that will be caused by climate change.

The ways in which individuals regard and perceive multipolarity:

- **Making Use of Mandalas to Set the Picture**

Mandalas, which are extremely sophisticated, have been of great use to individuals in understanding how odd modern culture is. India is making significant efforts to acquire new allies in the region, despite the fact that it already has good relations with China, Russia, and the United States of America. The idea that feelings should not serve as the foundation for partnerships was held by Kautilya. You have the ability to change your mind, which is why this is true. Obtaining this equilibrium is of the utmost importance; nonetheless, there should be no compromise on fundamental principles such as respecting authority and human rights.

- **To do so would be incorrect.**

Always honest and doing what was right, Kautilya was a man of integrity. He underlined that people should exercise extreme caution while speaking with law enforcement and that those in positions of authority should never tell lies or behave in an unfavorable manner when employing their authority. Since the beginning of time, people have felt a sense of obligation, even when they engage in behavior that is in direct opposition to the principles that govern democracy. It would be beneficial for the world if people were able to communicate with one another without difficulty, if there were no restrictions placed on the media, and if the government did not assume control of institutions.

According to Kautilya, the happiness of the people will be contingent upon the king's contentment. Considering the contemporary values of democracy and the utilization of power and assistance to accomplish goals, this technique makes perfect sense. People frequently take to the streets to express their dissatisfaction with the government, when they are unable to find work, when they are being mistreated, or when they feel threatened by someone in authority. People have a low level of trust in governments that do not care about their health because of this concern. Putting ethics at the forefront of management is not only the moral thing to do, but it also confers benefits on businesses.

What are the reasons that countries are less likely to collaborate politically when they are concerned about the environment and climate change? In order to maintain a consistent climate, Kautilya believed that crops and irrigation were of utmost importance. Currently, governments should also be responsible for developing plans to preserve the environment. When it comes to this particular situation, the government needs to devise a strategy that will allow businesses to grow while simultaneously safeguarding the environment.

Digital government: The Arthashastra discusses methods to keep a watch on things, which can translate in today's world as utilizing computers to follow individuals. One example of this is the implementation of digital government. Right now, a good government would ensure the safety of its citizens without infringing on their rights or compromising their privacy.

Kautilya believed that via the implementation of acceptable taxes, the global economy would become more equitable, firms would become more accountable, and income would be distributed more evenly.

There are many different ideas that have an impact on India's foreign policy, however the degree of that impact varies. In order to demonstrate how the Kautilyan philosophy operates, the Arthashastra grants India the authority to make its own decisions regarding matters of essential importance. India has collaborated with a number of influential organizations in an effort to persuade the rest of the world that it is a compassionate nation that is concerned about the rights of individuals as well as the health of all people. It is difficult to maintain strong moral ideals, such as advocating for democratic norms, while at the same time avoiding the trap of allowing pragmatism to evolve into exploitation.

It instructs us on how to strike a balance between concepts that are applicable in the real world and regulations from the Arthashastra that we are not required to adhere to without question. It is a sign that a government that lacks morals will fail, and that being immoral is a sign of weakness when it does not care about what is genuine.

6. Conclusion – Towards an Ethical Statecraft for the Future

The Arthashastra's wisdom can help the world a lot when things get tough. From this point of view, the government is not a bad thing or a good thing. It acknowledges the harsh realities of power while maintaining the belief that individual rights and welfare are paramount.

I believed Kautilya would know about the challenges that leaders now have, such how to deal with criticism from within, keep the peace among friends, and run the economy. But there are more risks now than there were back then. Things like climate change, nuclear weapons, and digital fighting put people all across the world at risk. So, doing the right thing is not only the right thing to do, it's also vital to stay in business. This is the case for the reason indicated

above.

The Arthashastra argues that ethics and pragmatism should be given the most weight and work together. If a management doesn't care about their workers' health, they will lose their job; if they don't care about how their actions affect real people, they will die. This is the best method to be a good leader. It is founded on accountability, can be changed, and can be employed in the actual world.

As the world becomes more unstable, countries need to discover a method to manage their governments that is not just strategic and beneficial, but also moral and practical. This new perspective transforms the Arthashastra from an ancient Indian text into a blueprint for the future, where ethics and authority can once more collaborate for the sake of society at large.

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CHAPTER – 5

NALANDA TO NANOTECHNOLOGY - INDIA'S LEGACY OF INTERDISCIPLINARY SCHOLARSHIP

ADVOCATE ANURADHA CHAKRABORTY
(High Court, Calcutta)

Department of Law, Brainware University, Kolkata, West Bengal
700125, India, E-mail: anuradhachakraborty126@gmail.com

1. Introduction: The Continuum of Knowledge in India

For a long time, people have hailed India as a country where ideas can flow freely in various areas, including science, technology, philosophy, literature, and more. Putting concepts together has been more significant than tearing them down in Indian philosophy's past. People now consider knowledge as one objective instead of a group of goals since this happened. Indian brains have always been unique because they can think creatively and logically at the same time. The oldest Vedic songs, for instance, used beautiful language to talk about strange notions about the world. Panini's methodical sutras used language with the same level of mathematical accuracy. Numerous people believe that studying numerous subjects at once leads to fresh ideas, but it's vital to realize

that this way of thinking has deep cultural roots in India.

Vikramshila, Takshashila, and Nalanda are among well-known schools that use this method of teaching. In addition to offering specialized instruction, these institutions also fostered healthy intellectual ecosystems that facilitated the coexistence and growth of diverse information kinds.

Many intellectuals at Nalanda study Buddhism while also fighting about language, medicine, space, and logic. This was one of the many things that students at Takshashila studied. They learned a lot of subjects, like commerce, law, welding, and surgery. Students couldn't become experts in just one thing since they could talk to each other about what they were learning. They didn't do that. Instead, they sought for the building blocks and links that diverse types of information had in common. There is no doubt that professionals and students from China, Korea, Tibet, Mongolia, and Southeast Asia desire to go to these schools. This is why people from all over the world flocked to India to learn.

There were more than one group doing this kind of intellectual endeavor. Indian philosophers show in their writings that they can connect things that don't seem to belong together. Aryabhata believed that astronomy was a fundamental part of math. Charaka's philosophical beliefs on how the mind and body work helped people stay healthy. Sushruta's medical writings were full of practical advice and insightful views about life. The Mahabharata and the Ramayana are epic stories that mix real events from history with myths, politics, morals, and religious ideals. This is an excellent example of how to mix different kinds of writing and topics without any difficulties. Indian wisdom has always strived to look at the world and ourselves from many angles instead of breaking things down.

In the twenty-first century, India is forging a name for itself in the scientific and technical world by building on its tradition of combining knowledge. India is a leader in many fields, including biotechnology, AI, nanotechnology, and space science. These changes don't happen because one profession works on its own; they happen because professionals from numerous professions work together to research them. Computer science, physics, engineering, materials science, and systems management are all growing better. The Indian Space Research Organization (ISRO) is a fantastic example of this. Innovations in biotechnology and nanotechnology must integrate science, engineering,

biology, and health. India has been doing intellectual research for hundreds of years, using both old and new instruments and methodologies.

The purpose of this segment is to convey how magnificent this trip was from the busy towns of Nalanda to India's sophisticated, cutting-edge labs. Indian research gets people from a variety of various fields to work together. This is an interesting way to connect the past to the present. The history of Indian knowledge systems demonstrates that novel concepts and discoveries have never emerged from a singular discipline in isolation, but rather from the interaction between various fields. We know that this method of thinking is very old in India's culture and history. Experts all across the world are starting to believe that working with experts from other areas is the best way to solve hard challenges.

2. Nalanda and the Ancient Universities: Cradle of Interdisciplinary Thought

Nalanda is a great example of India's heritage of culture and learning. The Gupta dynasty ruled from the fifth century CE to the present day. They constructed Nalanda University. It was one of the top places to learn in the world for roughly 700 years. At its heyday, Nalanda had more than 10,000 students and 2,000 teachers. The school taught more than just Buddhism. The school taught a lot of different subjects, like astronomy, linguistics, algebra, philosophy, logic, architecture, the arts, and medicine. People said that Nalanda possessed at least two libraries with volumes on every subject you could think of. People from all around Asia came to it since it featured so many learning tools.

Nalanda was just like any other place. People said that Taxila, which was founded in the sixth century BCE, was a fantastic place to learn. People currently conceive of Takshashila as one group, although it wasn't. It seemed more like a school or department where famous professors might give presentations on some topics. Chanakya, also known as Kautilya, taught these concepts regarding politics and government. He wrote about these principles in the Arthashastra, which is the most important texts on strategy and political economy. Jivaka, Magadha's royal doctor, learnt how to do surgery and medicine there. I appreciate how this shows that kids learn in different ways.

King Dharmapala of the Pala kingdom built Vikramshila in the seventh century. People also learned here. A lot of people heard about it because it was

about Buddhist theory, logic, and tantra. It also improved other areas of study, such as languages and astronomy. Vikramshila's work, along with that of Nalanda and Odantapuri, played a big component of keeping India at the top of higher education in the globe.

Different schools teach different subjects in different ways. Indian philosophy holds that all knowledge is interconnected. It's apparent that schools didn't have separate rooms for each subject because they weren't built that way. If a doctor wants to be better, they should learn how to think and act morally. To understand the universe, a philosopher needs to study science. After discussing about philosophy, we changed our opinions about health, ethics, and life in general. Advances in math also had a huge effect on the math used in astronomy. Scholars from other fields made crucial contributions because they casually shared their ideas, which led to new ways of thinking.

It was exciting to think that there might be more organizations like this in other regions of the world. Teachers and students from China, Korea, Tibet, Mongolia, and Southeast Asia poured into India, turning Nalanda and its sister schools into venues where people from all over the world could share their ideas. Xuanzang and Yijing, two famous Chinese travelers, journeyed to Nalanda for many years to learn about Buddhism, Indian arts and sciences, and other things. They learned more about the many educated people who lived in India as they brought back Chinese copies of Buddhist books. Their experiences indicate that these clubs are welcoming to people from all walks of life, which is incredibly essential. These exchanges had an effect on educational traditions that reached far beyond India. Because of this, news spread swiftly over the world.

In the 1200s, invaders devastated Nalanda and its homes and documents. It was the end of a thousand years of fighting in the mind. People stated that the vast library had been on fire for months, destroying one of the world's biggest stores of information. The principles underpinning transdisciplinary study persisted on long after the classes were completed, though. Ideas in South and East Asia were influenced by spoken, written, and monastic works. The fact that India's universities are still having an influence show how much the country values education and global awareness.

You may still apply a lot of what the schools in Vikramshila, Takshashila, and Nalanda taught. People from all over the world used to meet together and

converse with each other more than a thousand years ago. They wanted to accomplish the same thing for other fields of study. Schools today want students from diverse areas to work together so they may be more creative. These antique Indian buildings reveal that people in India have been striving for universal truths for a long time. They were not only schools; they were also places where individuals could discuss their opinions, where moral principles could be applied to healthcare, and where intellectual and scientific ideas could be brought together.

Nalanda and other universities from the middle Ages reveal that Indians thought of knowledge as a search for general truths. This means that they are more than merely important artifacts from the past. Their narrative shows how earnest study may emerge when people from diverse backgrounds and points of view communicate about important matters. There is no such thing as a lesson that doesn't help.

3. Knowledge across Disciplines: Ancient Indian Contributions to Science and Technology

India's early scientific and technological accomplishments demonstrate that its people were highly intelligent and did not distinguish between philosophy and science or between theory and practice. Ancient Indian thinkers thought that the search for knowledge was a broad endeavor that included all areas of study and saw them as connected rather than separate. Mathematics has impacted astronomy, ethics and philosophy have shaped medicine, and the domains of spirituality, the arts, and science have engaged with one another. This combination technique led to the creation of a new and useful body of knowledge that drew on ideas from different times and places.

3.1 Mathematics is the basis of scientific study.

India has a long tradition of doing well in math. The addition of place value, the decimal system, and the zero to the number line changed the way many people thought about numbers and math. Aryabhata figured out the number π with amazing accuracy and wrote about the theory in the fifth century CE that the globe rotated around its axis. This revolutionary idea linked math and science directly. Brahmagupta showed a high level of reasoning in the seventh century by coming up with systematic ways to solve quadratic equations and work with negative integers. These mathematical innovations had effects that went far beyond theory; they affected fields as different as astronomy, architecture, and economics. They gave people the tools they needed to come

up with new ideas that might be used in real life.

3.2 Making a cosmic map with astronomy

India created astronomy by logically combining math and observation. Aryabhata's *Aryabhatiya* introduced trigonometric functions that were very useful in celestial arithmetic. It also included models of how planets move and how eclipses happen that didn't use myths. Varahamihira's huge book, the *Brihat Samhita*, was more than just basic astronomy. His study included astronomy, geography, meteorology, and even cultural practices like astrology and omens. Based on this summary, it is obvious that Indian astronomy was not a separate field of study, but rather one that was connected to many others. Eventually, the Islamic world was able to read Indian astrological writings that had been translated into Persian and Arabic. They moved to the Middle East, where they had an effect on Islamic academics like Al-Khwarizmi and Al-Biruni, who then had an effect on European philosophers throughout the Renaissance.

3.3 The Medical Component of Life Science

The Ayurveda system is another great example of a system that has a lot of knowledge. The *Charaka Samhita* and the *Sushruta Samhita* are two old texts that talk about Ayurveda. They stress that people should think about their surroundings as well as their physical and emotional health. Charaka laid the groundwork for internal medicine by stressing the importance of diet, lifestyle, and preventive care. Sushruta's descriptions of surgical tools and methods, on the other hand, were spot on. His stories of having rhinoplasty and cataract surgery show how good the medical care is in India. But traditional Indian medicine was much more than a book. It was also based on theory and morality, with a focus on the healer's duty to keep everything in balance and harmony. The combination of scientific knowledge and moral ideals turned Ayurveda from a medical practice into a way of life.

3.4 The technological culture of engineering and metallurgy

India's skill in engineering and metalworking is a good example of how scientific information may be used in real life. The iconic iron pillar in Delhi shows how far metallurgy has come as it has been rust-free for more than 1,600 years. Metallurgists in ancient India made wootz steel, which was quite popular and sold in Europe and West Asia since it was so good.

They also came up with a way to separate zinc from other metals. Engineers,

mathematicians, and artists all worked together to build the temples' tall shikharas and detailed sculptures. These technological advances show that Indian knowledge systems were based on a complete view of the universe. Their cultural and religious surroundings weren't outside of them; they were a part of who they were.

3.5 Ways to learn through the arts and literature

In India, literature and the arts were never thought of as apart from science and philosophy. The Ramayana and the Mahabharata are two great examples of epics that tell stories about politics, morals, the universe, and the afterlife. People say that Bharata's Natya Shastra is just a book about drama, but it's not. It also looks at art, music theory, psychology, and acoustics. People thought of the performing arts as both fun and serious academic subjects (shastras) with set rules. This shows that in Indian culture, reason and creativity were not considered as opposites, but as things that worked well together.

An Internet Database: These achievements illustrate a paradigm shift towards perceiving knowledge as an interconnected web of disciplines rather than a mere aggregation of independent fields. Math had an effect on astronomy, philosophy had an effect on medicine, and faith and art had an effect on technology. Someone in India's intellectual elite a long time ago said that different fields should work together. This is where the foundation for modern interdisciplinary work was created. Indian academics have been using it for a long time before the name was made up. What they left behind still has an effect on schooling today.

4. Colonial Encounter and the Reawakening of Indian Scholarship

When India became a colony in the 18th and 19th centuries, it changed the way people thought in a fundamental way. Changes in society and politics over the last several hundred years have made it tougher for conventional forms of teaching, such those used in gurukuls, madrasas, and schools run by churches and monasteries, to succeed. The British colonial authority pushed these native institutions even farther to the side by putting in place a new school system that was more about satisfying the empire's bureaucratic needs than stimulating intellectual exploration.

The Minute on Indian Education, authored by Thomas Babington Macaulay in 1835, is the most important source that indicates this transformation. It made English education more important than Sanskrit, Persian, and other native

languages. Macaulay remarked that the purpose of education should be to create "a class of people who are Indian in blood and colour but English in tastes, morals, opinions, and intellect." This technique made English the main language of instruction, which pushed aside India's traditional learning traditions. Because of this, India's intellectual history was very different from the present colonial educational system. The main purpose was to teach individuals how to be clerks, translators, and low-level officials for the colonial government. Because of this, there weren't many chances for people to study on their own or come up with new ideas within their own cultures.

This disturbance, in a bizarre way, also started a fresh mental awakening. A collection of Indian thinkers and reformers came of age in the 1800s. They saw that India's own ways of learning needed to be brought back and that colonial education had flaws. Raja Ram Mohan Roy, who is widely called the father of the modern Indian renaissance, fought for rational and scientific education while also emphasizing on India's rich religious and philosophical background. Ishwar Chandra Vidyasagar, on the other hand, was particularly interested in classical Sanskrit education and desired to make society better, especially when it came to women's education and widows being married again. Swami Vivekananda talked to people from all around the world during the Parliament of Religions in Chicago in 1893. He advised Indians to embrace modern science and technology and reminded everyone of how deep Indian thought is. These reformers showed how to maintain and keep India's cultural history alive while simultaneously accepting modernity in their work.

In the late 1800s, the institutions that support modern Indian science were also built up. Dr. Mahendra Lal Sircar created the Indian Association for the Cultivation of Science (IACS) in Calcutta in 1876. This was a major step in the right direction. This was India's first university that only taught science. It proved that it wanted to learn for its own purpose, not only for helpful colonial reasons. This institution made it possible for Sir C.V. Raman to discover that light scatters after many years. He won the Nobel Prize in 1930 for this discovery, which put Indian science on the world scene.

In 1857, modern universities emerged in Calcutta, Bombay, and Madras. This helped a new group of Indian scientists and thinkers grow. These institutions began by training administrators in a colonial style, but they eventually produced ground-breaking scholars who merged Western and indigenous views.

India's scientific ingenuity and resilience against colonialism were further exemplified by significant personal accomplishments during this period. Jagadish Chandra Bose's ground-breaking work in plant physiology goes against strict Western science categories by proving that plants react in the same way to things that animals do. He also made key contributions to wireless communication, which helped future technologies move forward. A lot of people say that Prafulla Chandra Ray is the "founder" of contemporary Indian chemistry. He connected science and nation-building by creating India's first chemical company and achieving advancements in chemical research. Satyendra Nath Bose and Albert Einstein came up with the ideas of "bosons" and the basics of quantum statistics. These concepts continue to influence contemporary physics. Even though these experts were well knowledgeable about Indian intellectual traditions, they were receptive to modern scientific approaches and added to what was already known. This is what interdisciplinary entails.

Colonialism unintentionally generated a counter current of new ideas and rebirth in India to stop intellectual freedom. Synthesis was a key element of the intellectual ferment of the time. This meant that Indian scientists and philosophers thought thoroughly about Western science and philosophy while also using their own ideas. This mix not only maintained some portions of traditional knowledge alive, but it also allowed India a chance to take part in modern science on its own terms.

In this way, the colonial conference was both a story of fighting back and staying strong. A new generation of smart people came after the chaos. They maintained India's intellectual tradition alive and made it possible for the scientific and educational rebirth of the 20th century.

5. From Independence to Innovation: India's Scientific Renaissance

The year 1947 saw the start of a new era in politics and ideals for India. Being a colony hurt India's scientific infrastructure, and the country required a brave plan for innovation and knowledge to get back on its feet. Jawaharlal Nehru, India's first prime minister, came up with this idea and pushed for the development of a "scientific temper." Nehru believed that science encompassed more than mere research and technology. He thought it was about getting people to think, ask questions, and assist society move forward. When India got

independence, it spent a lot of money on creating new schools for research, applied science, and higher education. This was done to set the stage for a new era of science.

5.1 Making Institutions

Setting up organizations that might assist people learn and grow their skills in a lot of different areas was one of the first things that needed to be done. The Indian Institutes of Technology (IITs) have evolved significantly since they established in the 1950s. They are now known all over the world as centers for engineering and technology. The Council for Scientific and Industrial Research (CSIR) also established up a network of labs for applied science all around the state. The Bhabha Atomic Research Center (BARC) led research into nuclear energy, while the Indian Space Research Organization (ISRO) became a symbol of freedom and inventiveness in space science. Homi J. Bhabha, a visionary, headed both of them. Sociologists collaborate with technologists, physicists engage with engineers, and biologists partner with chemists. The purpose of these groups was to get people from different fields to work together. This mode of thought was like the old Nalanda, where no one domain of knowledge stood on its own.

5.2 Scientific breakthroughs

Having their own India's scientific effort got off to a terrific start right away, and it had tremendous results in several fields:

a) **Space Science:** The successful landing of Chandrayaan-3 in 2023, the success of the Mars Orbiter Mission (Mangalyaan, 2013), and ISRO's straightforward launch of the Aryabhata satellite in 1975 are all examples of fresh ideas that emerge from many sectors. People with skills in astrophysics, computer programming, materials science, and flight engineering had to work together for each trip.

b) **Nuclear Science:** Homi Bhabha's notion for safe nuclear energy, which merged physics, chemistry, and engineering, was the start of India's nuclear program. After that, India was able to offer both strategic security and energy.

c) **Agriculture:** The Green Revolution of the 1960s and 1970s, directed by M.S. Swaminathan, showed how genetics, ecology, and social sciences might be combined to solve one of India's biggest problems: food security. India used to not have enough food, but today it does because it grows high-yield crops, has better drainage, and uses scientific fertilizer.

d) **Information technology:** India's emergence to become a major IT

power in the 1990s illustrated how computer science might be employed with management, economics, and international trade. Indian IT workers are becoming tremendously vital to growth all across the world, and the countries own businesses are pushing digital revolution.

5.3 How Multidisciplinary Frontiers Have Expanded

During the late 20th and early 21st centuries, India became more open to new sectors that were naturally cross-disciplinary. The barriers between traditional fields started to dissolve in biotechnology, artificial intelligence, green energy, and nanotechnology. Nanotechnology was the best example of how India's idea of all-around education works. Physics (on the structure of atoms), chemistry (on nanoreactions and synthesis), biology (on nanomedicine and drug transport), and engineering (on nanomaterials and nanoelectronics) all need to work together in nanoscience.

The country is a prominent player in this field thanks to its universities, IITs, and research facilities like the Institute of Nano Science and Technology in Mohali and the National Center for Nanoscience and Nanotechnology in Mumbai. Scientists in India work with some of the top research teams in the world, write a lot of articles that are published in foreign publications, and make technologies that help people in the area and around the world.

5.4 Nanotechnology Case Studies

India still has a strong multidisciplinary spirit when it comes to modern studies, as these cases show:

a) **Nanomedicine:** Researchers in India are researching on ways to use nanoparticles to deliver drugs to help cure cancer. This will make it possible to give more individualized care with fewer negative effects.

b) **Agronanotechnology:** Scientists are testing nanobiosensors and nanofertilizers to see whether they can boost agricultural yields without harming the environment. This is done by using new technologies to address long-standing worries about food security.

c) **Energy:** Nanocoatings help India reach its green energy ambitions and keep its international climate promises by making solar cells last longer and operate better.

5.5 Keeping Your Word

These instances show that India's successes today are not merely the

consequence of modern needs, but are part of a long-standing intellectual tradition. Scientist's today work together from different professions to solve big problems, just like Aryabhata did when he integrated math and science and Sushruta did when he mixed philosophy and medicine. So, the resurgence of Indian science after independence reveals both the resuscitation of institutions and the revival of a mode of thinking that perceives knowledge as a whole.

India has proved that creativity flourishes when borders are broken by constructing great institutions, setting records in many scientific domains, and making breakthrough discoveries in subjects like nanotechnology that cross disciplines. So, since India became free, it has made sure that it stays an active contributor to world knowledge by transferring the deep learning legacy of civilization into the present day.

6. Conclusion – India's Timeless Legacy of Interdisciplinary Knowledge

You can see how knowledge is connected if you look back to Nalanda, where nanotechnology was born. This is an important idea in India's long history of thought. For thousands of years, Indian scientists, institutions, and philosophers have realized that working together across fields is better than working alone. This thought still has an impact on India's long-standing cultural contributions to the world's knowledge today.

In the past, holistic schools like Nalanda, Takshashila, and Vikramshila taught thinkers how the arts, sciences, and health might all work together in a good way. The medical, astrological, metallurgical, and mathematical achievements of the ancient world were not just impressive technological accomplishments but also components of a broader worldview that integrated ethics and science, as well as theory and practice. The scientific correctness in writing and the arts illustrates that creativity and reason may coexist without conflict.

Colonial forces intended to stop this practice and set up a better manner to teach when they got involved. But the schism itself led to a rebirth, with scientists and reformers improving India's intellectual reputation. Raja Ram Mohan Roy, Jagadish Chandra Bose, Prafulla Chandra Ray, and S.N. Bose proved that India could take ideas from other countries and still be its own country by putting together ancient and new scientific facts.

The CSIR, ISRO, BARC, and IITs are only a few of the study institutions that were created up after India became independent. They have all preserved the "scientific temper" that Nehru admired. In the past few years, people from different areas working together has led to remarkable things in computer science, nuclear power, space research, and farming. India has come up with new biotech, nanotech, and green energy approaches that have kept some of Nalanda's work alive in labs today.

The scientific rebirth in India doesn't mean rejecting tradition; it means building on it. India is an excellent illustration of how far research into humans may go. Many areas of study, from space science to the old sutras, work together to find the truth and serve people.

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CHAPTER – 6

ASSESSING THE TRANSFORMATIONS FROM GURUKUL TO GOOGLE: A SOCIOLOGICAL STUDY OF PEDAGOGICAL SHIFTS AND SOCIAL ACCESS IN INDIAN EDUCATION

Dr. SOVANA MUKHERJEE

Assistant Professor in Sociology, Durgapur Institute of Legal
studies,

Kazi Nazrul University, Asansol

Email: sovonamukherjee@gmail.com

1. Introduction

The Indian education system has undergone significant transformations over the centuries, from the ancient Gurukul system to the modern digital era. The Gurukul system, which dates back to the Vedic period, was characterized by a personalized and holistic approach to learning, where students lived with their gurus and learned through experiential and oral traditions. In contrast, the modern Indian education system has been shaped by colonialism, globalization, and technological advancements, leading to a complex and diverse educational landscape. In recent years, the Indian government has launched several

initiatives to promote digital education, such as the Digital India program and online learning platforms like Swayam and Diksha. These initiatives aim to increase access to quality education, particularly for marginalized communities and remote areas. However, despite these efforts, the Indian education system continues to face significant challenges, including inadequate infrastructure, teacher shortages, and social inequalities.

The COVID-19 pandemic has further accelerated the shift towards digital education, highlighting the need for a comprehensive understanding of the impact of technology on teaching-learning processes and social access in Indian education. This study seeks to contribute to this understanding by exploring the transformations from Gurukul to Google, and examining the pedagogical shifts and social access implications of digital education in India.

Research Problem: This research study aims to investigate the following research problems:

- **Pedagogical Shifts:** What are the changes in teaching-learning processes and pedagogical approaches that have occurred with the adoption of digital education in India? How have digital platforms influenced the way teachers teach and students learn?
- **Social Access Implications:** What are the implications of digital education for social access in India, particularly for marginalized communities such as:
 - Rural and remote areas with limited internet connectivity
 - Economically disadvantaged groups with limited access to digital devices
 - Socially excluded groups such as Dalits, Adivasis, and other backward classes
 - Differently-abled students who may face barriers in accessing digital content
- **Promoting Social Justice and Educational Equity:** How can digital education be leveraged to promote social justice and educational equity in India? What strategies can be employed to ensure that digital education benefits marginalized communities and promotes inclusive and equitable learning outcomes?

This study aims to provide a nuanced understanding of the complex relationships between technology, pedagogy, and social access in Indian

education, and to contribute to the ongoing discourse on the future of education in India.

- **Significance of the Study:** This study on the transformations from Gurukul to Google is significant for several reasons:
- **Understanding the Impact of Digital Education:** The study provides insights into the impact of digital education on teaching-learning processes and social access in India, particularly for marginalized communities. This understanding is crucial for policymakers, educators, and stakeholders seeking to leverage technology for educational transformation.
- **Informing Policy and Practice:** The study's findings can inform policy and practice in Indian education, particularly in the context of digital education initiatives such as Digital India and online learning platforms like Swayam and Diksha. The study's recommendations can help policymakers and educators design and deliver digital education programs that promote social justice and educational equity.
- **Promoting Inclusive and Equitable Education:** The study highlights the potential of digital education to promote inclusive and equitable education in India. By identifying strategies for addressing the digital divide and promoting access to digital education for marginalized communities, the study can contribute to the development of more inclusive and equitable education systems.
- **Contextualizing Digital Education in India:** The study provides a nuanced understanding of the complex relationships between technology, pedagogy, and social access in Indian education. By contextualizing digital education within the broader sociological framework of Indian society, the study can help educators and policymakers develop culturally responsive and contextually relevant digital education initiatives.
- **Contributing to Global Discourse:** The study's findings can contribute to the global discourse on digital education and its potential to promote social justice and educational equity. The study's insights can inform international development initiatives and global partnerships aimed at promoting education for all.

This study posits that India's shift from traditional Gurukul systems to modern digital education platforms has far-reaching implications for teaching methods and access to education, and that digital learning can be a potent catalyst for promoting social justice and equal educational opportunities, especially for marginalized groups, when tailored to the local context and

inclusive in its design and implementation.

1.1 Historical Context of Indian Education

1.1.1 Evolution of Indian Education System:

The Indian education system has a rich and complex history that spans thousands of years. From the ancient Vedic period to the present day, the system has undergone significant transformations in response to changing social, cultural, and economic contexts.

The ancient period, which dates back to around 1500 BCE, saw the emergence of a robust education system that emphasized the study of the Vedas, philosophy, and other sacred texts. The Gurukul system, where students lived with their gurus, was a hallmark of ancient Indian education. This system allowed for a personalized and holistic approach to learning, where students could develop their intellectual, physical, and spiritual growth. As time passed, the Gurukul system began to decline, and education became more formalized and ritualized during the medieval period. New educational institutions, such as the Takshashila and Nalanda universities, emerged during this period, showcasing the continued importance of education in Indian society.

The British colonial period had a profound impact on the Indian education system. The introduction of Western-style education led to the expansion of universities and colleges, and Lord Macauley's Minute of 1835 advocated for an education system that would produce Indians who were "Indian in blood and colour, but English in taste, in opinions, in morals and in intellect." This period saw a significant shift towards Western education, which continues to influence the Indian education system today. In the post-colonial period, India saw a significant expansion of education, with a focus on universalizing access to education. The National Policy on Education (NPE) of 1968 and 1986 aimed to promote education for all and to develop a more inclusive and equitable education system. The era of globalization and liberalization has seen significant changes in the Indian education system, with an increasing emphasis on privatization and technology-enabled learning. Today, the Indian education system continues to evolve, with ongoing efforts to improve access, equity, and quality in education.

1.1.2 Impact of Colonialism and Post-Colonialism on Indian Education System:

The impact of colonialism on Indian education has been profound and far-

reaching. The British education system displaced local knowledge systems, marginalizing Indian languages, cultures, and knowledge systems, and replacing them with Western education and values. This led to a generational disconnect from Indian heritage and created a sense of inferiority among Indians. The British system created a small, English-educated elite that served as intermediaries between the colonial administration and the broader population. This elite class was often disconnected from the masses and experienced cultural alienation. The neglect of mass education was another significant consequence of colonial rule. The British prioritized education for the elite, leaving the majority of Indians illiterate and excluded from formal education. This created a significant divide between the educated elite and the masses. Furthermore, the British system undermined scientific and technological education, limiting India's capacity for innovation and progress.

In the post-colonial era, India has made efforts to reform its education system, aiming to incorporate Indian values, languages, and knowledge systems. Leaders like Jawaharlal Nehru emphasized the importance of science and technology while promoting Indian culture. However, despite these efforts, the legacy of colonial education continues to influence Indian education. The divide between urban and rural areas, as well as between the elite and the masses, remains a significant challenge. Today, India faces the challenge of balancing modern, globalized education with preserving its rich intellectual traditions and cultural heritage. The privileged position of English in higher education remains contentious, providing global opportunities but reinforcing social inequalities. The examination-centric approach, emphasis on rote learning, and hierarchical institutional structures persist in many educational contexts. Eurocentric perspectives and under-valuations of indigenous knowledge systems continue to affect educational content. Centralized educational bureaucracies established during colonial rule still influence educational governance.

1.2 Contemporary Challenges and Opportunities in Indian Education:

Contemporary Challenges in Indian Education: Indian education faces numerous challenges that impact its quality and accessibility. Unequal access to education persists, particularly in rural areas where infrastructure deficiencies, teacher shortages, and socio-economic factors hinder learning. Many schools in rural areas lack basic facilities, such as classrooms, toilets, and drinking water, making it difficult for students to learn effectively. Additionally, teacher shortages and inadequate training programs compromise education quality, as

teachers may not have the necessary skills and knowledge to deliver high-quality instruction. The curriculum often fails to align with industry needs, resulting in a mismatch between graduates' skills and job market requirements. This can lead to high unemployment rates among graduates, as they may not possess the skills and knowledge required by employers. Inadequate funding affects infrastructure development, teacher training, and resource allocation, ultimately impacting education quality. Furthermore, the digital divide creates unequal learning opportunities, with some students having limited or no access to technology, which can hinder their ability to develop essential digital skills.

Opportunities for Growth and Improvement: Despite these challenges, Indian education has opportunities for growth and improvement. Leveraging technology can enhance teaching and learning experiences, increase accessibility, and promote personalized learning. Online learning platforms, digital resources, and educational apps can provide students with access to high-quality educational content, even in remote areas. Expanding STEM education programs can develop innovation and prepare students for future job markets. STEM education can equip students with critical thinking, problem-solving, and analytical skills, making them more employable in a rapidly changing job market. Implementing inclusive policies and programs can ensure equitable access to education for all.

This can include initiatives such as scholarships, subsidies, and affirmative action programs that target disadvantaged groups. Promoting collaboration between academia and industry can align curricula with market needs and enhance employability. Industry partnerships can provide students with practical experience, internships, and job opportunities, making them more attractive to potential employers. The National Education Policy (NEP) 2020 aims to transform Indian education by emphasizing flexibility, multidisciplinary learning, and promoting research and innovation. By harnessing these opportunities, India can work towards creating a more inclusive, effective, and globally competitive education system.

2. Pedagogical Shifts in Indian Education

2.1 Analysis of Pedagogical Approaches in Traditional Gurukul System:

The traditional Gurukul system was a holistic approach to learning that integrated spiritual, moral, and intellectual development within a residential setting under the guidance of a revered Guru. This system fostered a deep

understanding of various subjects, including Vedic texts, philosophical inquiry, and practical skills, through oral traditional knowledge and experiential learning. The Gurukul system was built on several key pedagogical approaches that made it a unique and effective model of education. At its core was the Guru-Shishya relationship, which provided personalized mentorship and customized guidance tailored to each student's unique strengths and needs. This approach allowed students to receive individualized attention and support, enabling them to reach their full potential. The system also emphasized experiential learning, where students learned through hands-on practice and real-world experiences rather than just theoretical knowledge. This approach taught students the practical application of knowledge and life skills, preparing them for the challenges of everyday life. The oral tradition was another important aspect of the Gurukul system, where education relied heavily on oral transmission of knowledge, memorization, and recitation. Repeated chanting and discussions facilitated deep comprehension and critical thinking, helping students to develop a profound understanding of the subjects they studied.

Lively debates and discussions, known as *Shashtra Artha* and *Sambhashane*, were also a key feature of the Gurukul system. These debates encouraged critical thinking, logical reasoning, and intellectual rigor, helping students to develop their analytical skills and think creatively. The curriculum was comprehensive and balanced, focusing on holistic development that encompassed spiritual, moral, intellectual, and physical growth. Students studied a wide range of subjects, including Vedas, scriptures, mathematics, astronomy, music, arts, and physical skills like archery and yoga. This holistic approach helped students develop into well-rounded individuals with a strong foundation in various aspects of life.

The teaching methods employed in the traditional Gurukul system were diverse and effective. *Storytelling* was a key approach used to teach complex concepts and promote critical thinking. Stories were used to convey moral values, spiritual lessons, and intellectual ideas, making learning engaging and accessible. *Puzzles and games*, such as *Prahelika*, were also used to increase imagination, thinking power, and observation skills in students. These activities encouraged creative problem-solving and analytical thinking. *Group discussions*, known as *Chintanika*, were another important teaching method. This approach involved students engaging in lively debates and discussions to explore diverse viewpoints and develop intellectual rigor. Through *Chintanika*, students learned to articulate their thoughts, listen to others, and think critically. *Self-education* was

also encouraged, with students being motivated to engage in self-study and contemplation to deepen their understanding. This approach helped students develop a sense of responsibility for their own learning and cultivate a deeper understanding of the subjects they studied. By incorporating these teaching methods, the Gurukul system provided a well-rounded education that fostered intellectual, moral, and spiritual growth.

2.2 Impact of Technology on Teaching-learning Processes:

Technology has revolutionized the Indian education system, transforming teaching-learning processes in various ways. By leveraging technology, educators can create personalized learning experiences that cater to the unique needs, abilities, and learning styles of individual students. AI-powered tools facilitate competency-based learning, allowing students to learn at their own pace and focus on areas where they need improvement. This approach enables teachers to provide targeted support and interventions, leading to better student outcomes. Interactive learning platforms, educational games, and virtual simulations have made learning more engaging and fun. These tools captivate students' interest, encouraging active participation and fostering creativity and critical thinking skills. By incorporating multimedia elements, such as videos, animations, and graphics, educators can make complex concepts more accessible and easier to understand. This, in turn, can lead to improved student motivation and a more enjoyable learning experience.

Technology has also expanded access to high-quality education in India, bridging the gap between urban and rural areas. Online courses, e-books, and educational apps provide students with a wealth of information at their fingertips, enabling them to learn beyond the confines of the traditional classroom. This increased accessibility has opened up new opportunities for students who may not have had access to quality education otherwise. Furthermore, technology has facilitated collaboration and communication among students, teachers, and peers. Virtual classrooms and video conferencing tools enable remote learning, allowing students to participate in discussions and engage with educators from anywhere. This has made it possible for students to learn from experts and connect with peers from diverse backgrounds, broadening their perspectives and understanding of different cultures. Overall, the integration of technology in Indian education has transformed the way students learn and teachers teach. By harnessing the potential of technology, educators can create a more inclusive, effective, and student-centered education system that prepares students for success in the digital age.

Despite the benefits, technology integration in Indian education faces several challenges. Ensuring equal access to technology and internet connectivity is crucial to bridging the digital divide. Providing teachers with professional development opportunities and training on technology integration is essential for effective implementation. Implementing robust cybersecurity measures and ensuring data privacy are critical to protecting student data. Addressing these challenges requires a multifaceted approach, including infrastructure development, teacher training, and policy reforms. By acknowledging and addressing these challenges, educators can harness the potential of technology to create a more inclusive, effective, and student-centered education system.

2.3 Shift from Teacher-centric to Student-centric Approaches:

The shift from teacher-centric to student-centric approaches in Indian education is a significant pedagogical shift aimed at enhancing critical thinking, creativity, and practical skills among students. This approach prioritizes the student's needs, abilities, and interests, making learning more engaging and effective. By focusing on experiential learning, educators can create a learning environment that encourages active participation, creativity, and critical thinking. Students learn by doing, working on projects, and solving real-world problems, which helps them develop essential life skills. Project-based learning is another key aspect of student-centric approaches, where students work on complex projects that require research, analysis, and problem-solving. This approach helps students develop critical thinking, collaboration, and communication skills, preparing them for success in today's fast-paced, technology-driven world. Technology integration is also a crucial element, as it enables students to access a wealth of information, learn at their own pace, and develop essential digital skills.

Collaborative learning is also encouraged in student-centric approaches, allowing students to work in groups, share ideas, and learn from each other. This approach helps students develop essential life skills, such as teamwork, communication, and conflict resolution. By working together, students can share perspectives, build on each other's strengths, and develop a more nuanced understanding of complex concepts. Moreover, student-centric approaches focus on developing specific skills and competencies rather than just theoretical knowledge. This approach helps students become more autonomous, self-directed learners, taking ownership of their learning and developing a growth mindset. By emphasizing competency-based education, educators can ensure

that students are well-prepared for the demands of the 21st century, with skills that are relevant and valuable in the modern workforce.

Overall, the shift to student-centric approaches in Indian education has the potential to transform the learning experience, making it more engaging, effective, and relevant to the needs of students in the 21st century. By prioritizing student needs, abilities, and interests, educators can create a learning environment that fosters creativity, critical thinking, and practical skills, ultimately preparing students for success in an increasingly complex and interconnected world.

Despite the benefits, implementing student-centric approaches in Indian education poses several challenges. Many schools lack the necessary infrastructure to support these approaches, such as technology, resources, and facilities. Teachers also need training and support to effectively implement student-centric approaches, which can be a significant challenge. Additionally, traditional assessment methods may need to be revised to accommodate student-centric approaches, which can be a complex and time-consuming process. Addressing these challenges is crucial to ensuring that student-centric approaches are implemented effectively and sustainably, ultimately benefiting students and enhancing the quality of education in India.

2.4 Role of Digital Platforms in Enhancing Student Engagement and Learning Outcomes:

Digital platforms have revolutionized the Indian education system, transforming the way students learn and interact with educational content. By leveraging digital platforms, educators can enhance student engagement, improve learning outcomes, and increase accessibility. Digital platforms offer a range of interactive tools and resources that can captivate students' attention and encourage active participation. These platforms provide opportunities for students to engage with multimedia content, such as videos, animations, and simulations, making complex concepts more accessible and fun to learn. Interactive quizzes, games, and discussions also foster a sense of community and collaboration, helping students stay motivated and interested in their studies.

Digital platforms can also improve learning outcomes by providing personalized learning experiences tailored to individual students' needs and abilities. Adaptive learning technologies use data and analytics to adjust the

difficulty level and content of learning materials, ensuring that students are challenged and supported appropriately. This approach can lead to better academic performance, increased confidence, and a more positive attitude towards learning. Digital platforms have also increased accessibility in Indian education, enabling students to access high-quality educational resources and courses from anywhere. Online learning platforms, MOOCs (Massive Open Online Courses), and educational apps provide students with a wealth of information and learning opportunities, bridging the gap between urban and rural areas. This increased accessibility has opened up new opportunities for students who may not have had access to quality education otherwise.

While digital platforms offer many benefits, there are also challenges and limitations to consider. Issues such as digital divide, infrastructure limitations, and cybersecurity concerns need to be addressed to ensure that digital platforms are used effectively and safely. Additionally, teachers need training and support to effectively integrate digital platforms into their teaching practices. Digital platforms, however, have the potential to transform the Indian education system, enhancing student engagement, improving learning outcomes, and increasing accessibility. By leveraging digital platforms effectively, educators can create a more inclusive, effective, and student-centered education system that prepares students for success in the digital age.

3. Social Access and Inclusion in Indian Education

3.1 Analysis of Social Inequalities in Indian Education System:

Social inequalities in the Indian education system are multifaceted and deeply ingrained, affecting millions of students across the country. These inequalities stem from various factors that includes:

One of the primary factors contributing to these inequalities is the *caste system*, which continues to influence access to education. Students from lower castes, particularly Dalits and Adivasis, face social stigma, bullying, and humiliation in schools. Teachers may hold biases, and curricula often ignore the history and culture of marginalized communities. This creates a hostile learning environment that can be detrimental to the academic performance and well-being of these students. *Socioeconomic disparities* also play a significant role in perpetuating educational inequalities in India. Students from wealthier families can afford private schools with better resources, while those from economically disadvantaged backgrounds are often relegated to underfunded government schools. This disparity creates an unequal playing field, where children from

marginalized communities are at a disadvantage. The quality of education, infrastructure, and resources available to students from different socioeconomic backgrounds vary significantly, affecting their academic outcomes and future opportunities.

Language barriers and gender disparities are other significant challenges facing the Indian education system. India's linguistic diversity can create challenges for students who speak different languages or dialects, leading to difficulties in understanding and communicating effectively in the classroom. Additionally, girls, especially in rural areas, face significant barriers to education due to traditional norms and expectations. They are more likely to drop out of school, and their literacy rates remain lower than those of boys. These disparities are often perpetuated by societal attitudes and biases that limit opportunities for girls and women.

The *urban-rural divide* is another significant factor contributing to educational inequalities in India. Urban areas have well-resourced schools, while rural areas struggle with infrastructure challenges and limited access to quality education. Students from rural areas often have limited access to quality educational resources, including qualified teachers, textbooks, and technology. This can affect their academic performance and limit their future opportunities.

The consequences of educational inequality in India are far-reaching and multifaceted. One of the most significant effects is the achievement gap between students from disadvantaged backgrounds and their wealthier peers. Students from marginalized communities consistently perform lower on standardized tests and exams, which can be attributed to various factors, including limited access to quality educational resources and inadequate support systems. Another significant consequence of educational inequality is limited access to higher education, particularly for students from rural areas. These students often struggle to find institutions nearby, and the cost and logistical challenges of traveling to urban centers limit their chances of further education. This can lead to a lack of representation from rural areas in higher education institutions, perpetuating the cycle of inequality.

The *social and economic implications of educational inequality* are profound. Educational inequality can perpetuate cycles of poverty and social inequality, limiting opportunities for social mobility and economic advancement. When individuals from marginalized communities lack access to quality education,

they are often relegated to low-paying jobs or informal sectors, which can trap them in a cycle of poverty. This, in turn, can have far-reaching consequences for the overall development and growth of the country, emphasizing the need for policies and interventions that promote equitable access to quality education.

To address these inequalities, the Indian government has implemented policies like:

Right to Education Act: The Indian government has implemented the Right to Education Act, which guarantees free and compulsory education for children aged 6-14. This landmark legislation aims to ensure that all children, regardless of their background or socioeconomic status, have access to quality education. By making education a fundamental right, the government has taken a significant step towards promoting educational equity and reducing disparities.

Reservation System: The Reservation System is another policy initiative aimed at promoting educational equity. This system reserves seats in educational institutions for students from Scheduled Castes (SC), Scheduled Tribes (ST), and Other Backward Classes (OBC). By providing reserved seats, the government aims to increase representation and access to education for historically marginalized communities. This policy acknowledges the historical injustices faced by these communities and seeks to address them through affirmative action.

Scholarships and Financial Aid: The government also provides scholarships and financial aid to students from marginalized communities. These initiatives aim to support students who face financial barriers to accessing education. By offering financial assistance, the government can help level the playing field and ensure that students from disadvantaged backgrounds have equal opportunities to pursue their education. This support can be crucial in helping students overcome financial constraints and achieve their academic goals.

To ensure equal access to quality education for all, more needs to be done. This includes increasing funding to improve infrastructure, teacher training, and educational materials. Additionally, promoting inclusivity through policies that foster diversity, equity, and inclusion can help break down social and cultural

barriers. Furthermore, community engagement is crucial, as involving local communities in the education process can help identify and address specific needs, ultimately leading to better educational outcomes for all students.

3.2 Impact of Digital Divide on Access to Education:

The digital divide has a profound impact on access to education in India, particularly in rural and economically disadvantaged areas. This divide refers to the disparity between those with access to information and communication technology (ICT) and those without, resulting in unequal opportunities for students to acquire knowledge and skills. The digital divide *limits access to online learning* for students in rural areas, who struggle to participate in online classes due to lack of internet connectivity, devices, and digital literacy. This creates a significant barrier to education, especially for students who rely on online resources to supplement their learning.

The *urban-rural divide* exacerbates the digital divide, with significant differences in internet penetration and digital literacy rates between urban and rural areas. This divide perpetuates inequalities in education, making it challenging for rural students to access quality educational resources. *Device ownership* is another challenge, as many rural households do not own smartphones or computers, hindering students' ability to access digital resources and complete assignments. Furthermore, rural schools often lack *proper infrastructure* like functional computer labs and internet access, making it difficult for students to develop the digital skills they need to succeed in today's world.

The digital divide perpetuates social inequalities, hindering upward mobility and limiting opportunities for rural communities. To bridge this gap, efforts are being made, such as:

The government plays a crucial role in bridging the digital divide by implementing policies to improve digital infrastructure, providing funding, and promoting digital literacy. By investing in digital infrastructure, the government can ensure that rural areas have access to reliable internet connectivity, devices, and digital tools. Additionally, government initiatives can promote digital literacy among students, teachers, and community members, enabling them to effectively utilize digital resources and participate in the digital economy.

The private sector is also vital in bridging the digital divide, as companies can

invest in digital education initiatives, innovate low-cost solutions, and collaborate with governments to promote digital inclusion. Private sector involvement can bring innovative solutions, expertise, and resources to the table, helping to address the digital divide and promote digital literacy. By partnering with governments and community organizations, private companies can help ensure that digital initiatives are scalable, sustainable, and effective.

Community engagement is essential in bridging the digital divide, as it involves conducting awareness campaigns, promoting digital literacy, and equipping teachers with digital skills. By engaging with local communities, organizations can raise awareness about the importance of digital literacy, promote digital inclusion, and build trust in digital initiatives. Community engagement can also help identify specific needs and challenges, enabling organizations to develop targeted solutions that meet the unique needs of rural communities.

Digital literacy programs are critical in bridging the digital divide, as they introduce coding and computer science education, even in elementary school, to foster creativity and problem-solving skills. By promoting digital literacy, these programs can empower students to participate in the digital economy, develop essential skills, and pursue careers in technology. Digital literacy programs can also help bridge the gap between urban and rural areas, ensuring that students from all backgrounds have access to digital opportunities and resources.

By addressing the digital divide, India can work towards ensuring equitable access to quality education for all its citizens, regardless of their geographical location or socioeconomic background. This requires a multifaceted approach that involves government, private sector, and community stakeholders working together to provide digital infrastructure, promote digital literacy, and support inclusive education.

3.3 Role of Digital Platforms in Promoting Social Inclusion:

Digital platforms are revolutionizing Indian education by promoting social inclusion and bridging the gap between urban and rural areas. The Indian government has introduced several *online learning platforms* to promote digital education and increase access to quality educational resources. One such platform is DIKSHA, a national digital platform for school education that provides teachers, students, and parents with a wide range of educational resources. DIKSHA aims to promote digital literacy and improve learning

outcomes by offering interactive and engaging content. Another notable online learning platform is SWAYAM, which offers courses and certifications to students across the country. SWAYAM makes education accessible to a wider audience, including those in remote or underserved areas. The platform provides a range of courses, from school-level education to higher education, and offers certifications upon completion. This initiative has expanded access to quality education and promoted lifelong learning. During the COVID-19 pandemic, the government launched e-Vidya, an initiative to provide online education and ensure continuity of learning. e-Vidya enabled students to access educational content and resources remotely, minimizing disruptions to their education. This initiative demonstrated the potential of digital education in responding to emergencies and promoting educational resilience.

The Indian government has launched several digital initiatives to promote digital empowerment and inclusion. The Digital India program is a comprehensive initiative aimed at transforming India into a digitally empowered society. This program focuses on enhancing broadband connectivity, promoting digital literacy, and providing citizens with access to digital services. By leveraging technology, Digital India seeks to improve governance, promote economic growth, and enhance the overall quality of life for citizens. To address the digital divide in rural areas, the government has launched the Pradhan Mantri Gramin Digital Saksharta Abhiyan (PMGDISHA) initiative. This program aims to make at least one person in every rural household digitally literate, enabling them to access and utilize digital services. By promoting digital literacy, PMGDISHA seeks to empower rural citizens and provide them with opportunities for socio-economic development. The National Digital Literacy Mission (NDLM) is another initiative focused on promoting digital literacy among citizens, especially in rural areas. This program recognizes the importance of digital skills in today's digital age and seeks to equip citizens with the necessary knowledge and skills to access and utilize digital services. By promoting digital literacy, NDLM aims to bridge the digital divide and promote inclusive growth, enabling citizens to participate in the digital economy and access opportunities for personal and professional development.

The integration of digital platforms in education has transformed the way students learn and interact with educational content. By expanding access to learning opportunities, digital platforms have bridged the geographical divide, enabling students in rural and remote areas to access quality educational

resources. Digital platforms also enable personalized learning experiences, allowing students to learn at their own pace and in their own style. This approach helps to improve student engagement, motivation, and overall academic performance. Additionally, digital platforms facilitate collaboration and communication among students, teachers, and parents, fostering a more inclusive and supportive learning environment. The benefits of digital platforms in education are numerous, including increased flexibility, accessibility, and effectiveness. By leveraging digital technologies, educators can create more engaging, interactive, and student-centered learning experiences, ultimately leading to better academic outcomes and a more empowered generation of learners.

The integration of digital technologies in education faces several challenges that need to be addressed to ensure effective digital learning. One of the primary concerns is the digital divide, which refers to the disparity between students who have access to digital devices, internet, and digital literacy, and those who do not. This divide can exacerbate existing inequalities and limit opportunities for students who are already disadvantaged. Another challenge is ensuring that schools have the necessary infrastructure and resources to support digital learning. This includes providing reliable internet connectivity, devices, and digital tools that can support teaching and learning. Without adequate infrastructure and resources, schools may struggle to implement digital initiatives, and students may not be able to access the digital content and resources they need to succeed. Furthermore, teacher training is a critical component of successful digital transformation in education. Educators need to be equipped with the skills and knowledge to effectively integrate digital technologies into their teaching practices. This includes understanding how to use digital tools, designing engaging digital content, and using data and analytics to inform instruction.

4. Conclusion

The integration of digital education has the potential to promote social justice and equity in education by increasing access to quality educational resources, personalized learning, and digital literacy. However, challenges such as the digital divide, infrastructure limitations, and teacher training must be addressed to ensure that digital education benefits all students equally. By harnessing the potential of technology, educators and policymakers can create more inclusive and equitable learning environments that support the needs of diverse student populations.

To realize the full potential of digital education in promoting social justice and equity, it is essential to invest in digital infrastructure, provide comprehensive teacher training, and implement digital literacy programs. Educational technology should be designed with diverse needs in mind, and policies should be developed to address digital inequality and promote equity in education. Future research should focus on exploring the impact of digital education on marginalized communities, developing effective strategies for addressing the digital divide, and designing inclusive educational technology. Practitioners should prioritize ongoing professional development, staying up-to-date with the latest research and best practices in digital education. By continuing to explore and address the challenges and opportunities of digital education, we can work towards creating a more equitable and inclusive education system.

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CHAPTER – 7

DIASPORA AS CULTURAL AMBASSADORS: REIMAGINING BHARAT GLOBALLY

BULBUL ROY CHOWDHURY (GHOSH)

Assistant Professor, Department of Law, Brainware University,
blrc.law@brainwareuniversity.ac.in

KRISHNA GHOSH

Assistant Professor, Department of Law, Brainware University,
kg.law@brainwareuniversity.ac.in

1. Introduction

The word 'Diaspora' derives from the work of Greek historian Thucydides (B.C. 4th), who typically applied it to the dispersal of the Greeks (Ashok, 2024). In recent contemporary history (20th century), though, it was extensively applied to reveal the dispersal of the Jews in the post 1940s (Ashok, 2024). Subsequently, towards the close of the 20th century, the word diaspora was generalized further to explain the phenomenon of all types of people's movement in the entire world (Grossman, et.al, 2018). Then, around the 1970s, in academia, a distinct/independent field appeared to examine theoretically (systematically) such movements of the people and is called the 'Diaspora

Studies' (Grossman, et.al, 2018). After then, a vast body of scholarly literature has evolved on the topics (Grossman, et.al, 2018). There is no shortage of the scholarly definitions of diaspora, at times giving rise to some ambiguities (Brubaker, et.al, 2005). For instance, it is claimed by Brubaker that the term diaspora has been used for nearly any population or group of individuals dwelling outside its place of origin (Brubaker, et.al, 2005). Oxford bibliographies describe the term diaspora as, often involuntary, spreading of the population from a motherland to various regions, thus forming communities and identities in terms of the histories and outcomes of dispersal (Kenny, 2013). The Indian diaspora is "one of the largest and most influential in the world" comprising more than 35 million individuals of "Indian origin" distributed on almost every continent (Fernandes, 2014). Historically, as a global community, the diaspora has been a key generator of India's growth through remittances, investment, and economic linkages with trade. It has also enhanced India's international position by serving as a key cultural bridge (Fernandes, 2014). Nonetheless, India-diaspora relations have evolved since "Prime Minister Narendra Modi's ascension to power," with increased emphasis placed upon political outreach, economic integration, and cultural diplomacy. (Fernandes, 2014). Prime Minister Modi has since taken a deliberate effort to present the diaspora as ambassadors not only of India's rich cultural heritage but also of its advancement (Chaubey, 2024). Initiatives like the "Global Pravasi Rishta Portal," which strengthens the connection between the diaspora and Indian missions abroad, and the expansion of consular services, have facilitated smoother interactions and improved the diaspora's sense of belonging (Chaubey, 2024). Additionally, Modi's government has placed significant emphasis on fostering pride among Indian expatriates, making them an integral part of India's global identity (Chaubey, 2024). High-profile events such as the Madison Square Garden rally in the United States, "Howdy Modi" in Houston, and similar programs in Australia and the United Kingdom have elevated the diaspora's status, transforming them into strategic stakeholders in India's foreign policy. (Deb, 2016). These rallies not only showcased Modi's charismatic leadership but also underlined the diaspora's role as a force multiplier in strengthening bilateral ties with host countries (Deb, 2016). This essay explores the ways that Modi has altered diaspora relations, focusing on diplomatic initiatives and policy steps that have enhanced their role in India's economic and soft power narrative (Deb, 2016). It also considers the wider implications of the engagement, reflecting on how the diaspora is an important asset for India's geopolitical and cultural ambitions (Chaubey, 2024). This research will provide illumination on how a global community can be utilized

in order to achieve mutual growth and influence by examining the development of diaspora interactions (Chaubey, 2024).

2. Cultural Diplomacy

Cultural diplomacy is a structured form of diplomacy that encourages a deliberate attempt of cultural exchange (Khalid,2014). It enables the understanding of foreign cultural forces. It is exchange of ideas, information, art, way of life, value system, customs, belief and other things about cultures (Khalid,2014). Cultural Diplomacy has been pursued as a tradition for centuries. Expeditionists, travelers, educators and artists are all be able to be represented as examples of informal ambassadors or pioneers of cultural diplomacy (Khalid,2014). Such exchange may take place in such fields as art, sports, literature, music, science and economy. Communication and mutual respect among participating cultures that is based upon improved comprehension of respective values and decreased exposure to stereotypes is what exchange in these fields entails (Isar,2020). Cultural diplomacy plays a significant role in the integration of nations like between the African Union, League of Arab States, and European Union to others. It helps to improve international relations and acquire agreements that touch on issues like trade, investment, tourism, and security (Isar,2020). Private and public corporations and non-governmental agencies (NGOs) use cultural diplomacy as an instrument for steering government policies to suit their interest or for a specific cause. Individuals also use cultural diplomacy to befriend others or during arguments to form opinions about a given issue (Isar,2020). India is the cultural hub of South Asia and the oldest civilization on the Indian Ocean coast. Owing to its past, ancient religions, size, diversity and population, India has the pride of possession of an ancient civilisation (Isar,2020). Its religious and cultural sites, temples, monuments such as Taj Mahal and the Ganges of Varanasi are a marker of the Indian culture. A fascinating blend of ancient culture, India is blessed with vast contrasts and architectural grandeur (Isar,2020). The Indian culture has managed to endure over the centuries for the sole reasons of antiquity, oneness, continuity and universality of its nature. India has been sending out its culture in all directions (Khalid,2014). Its cultural impacts are present in Afghanistan, Iran and Central Asian republics and are experienced in nearly every country on the coast of Indian Ocean (Khalid,2014). Spread of Indian culture has been a two-way process. The pilgrims and the travellers travelled to India at various times during history and told the world outside about Indian culture. However, the best vehicle of dissemination of Indian Culture has been the Indians who migrated to the nook and corners of the Indian Ocean during the last millennia

(Isar,2020).

3. Historical Evolution of Indian Diaspora Policy

Indian policy towards its diaspora itself has seen a sea change since the time India attained its independence. India's foreign policy in the early years after 1947 was predominantly spent on nation-building and dealing with the ailments of post-colonial development (Chaubey, 2024). After Jawaharlal Nehru's leaders, the Indian government pursued an aversion policy towards the diaspora, were cautious of double allegiance and a lack of resources to engage in significant interaction with the international Indian community (Chaubey, 2024). Most diplomatic engagement was focused on addressing political, social, and economic challenges faced by People of Indian Origin (PIOs) in countries like Burma, Fiji, and Sri Lanka. With the onset of globalisation and economic liberalisation during the 1990s, the diaspora policy of India underwent a basic shift (Shreya, 2017). Indian officials actively pursued Indian citizens abroad to realise the economic and political potential of the diaspora (Shreya, 2017). The transformation of the government to more formal involvement was characterized by attempts like creating Pravasi Bharatiya Divas (PBD) and the Ministry of Overseas Indian Affairs (MOIA) in 2004. (Ministry of External Affairs, 2011). These were an initial attempt to promote remittances, investments, and knowledge transfer. However, the relationship was mostly transactional, viewing the diaspora as primarily an economic good and not as India's partners in its broader development goals (Chaubey, 2024).

4. Leveraging The Indian Diaspora for National Development

Indian Prime Minister recognized that mere speeches would not be enough to secure the Indian Diaspora's support in the nation's development strategy (Srinivas, 2019). He acknowledged their vital role not only in India's domestic progress but also in enhancing the country's global image (Srinivas, 2019). The Indian Diaspora contributes significantly through remittances, investments, lobbying for India on international platforms, preserving Indian culture abroad, and showcasing the nation's values through their intellect and hard work (Srinivas, 2019). In 2014, Indian Diaspora remittances reached \$70.39 billion—surpassing the \$64.14 billion sent by the Chinese Diaspora to their homeland (Srinivas, 2019). These private remittances account for around 3.5% of India's GDP and even exceeded the country's foreign direct investment in 2015, which stood at just \$44.9 billion (Srinivas, 2019). Additionally, the spending habits of

the Diaspora while visiting India stimulate local economic activity (Ganguly, 2018). They can also be encouraged to contribute to charitable trusts, NGOs, and various sectors, including adopting villages to directly uplift communities (Ganguly, 2018). Their engagement in science and technology can create employment opportunities for youth in rural and other regions (Ganguly, 2018). Given the looming challenges India faces, particularly with a growing unemployed youth population and an increasing number of senior citizens, the financially empowered Diaspora can also support the construction of senior citizen homes and invest in employment-generating initiatives as part of their philanthropic contributions (Ganguly, 2018).



Map– 1 – Indian Diaspora. Source: (Ashok, 2024).

5. The Indian Council for Cultural Relations

The Indian Council of Cultural Relations (ICCR) was established in 1950—the year India adopted its Constitution—under the illustrious leadership of Maulana Abdul Kalam Azad, with Prime Minister Jawaharlal Nehru serving as its first President (Mark, 2008) (Isar, 2020). Its founding embodied India's ethos of cultural relations with every country, consistent with Nehru's vision of "peaceful co-existence" and non-alignment, demonstrating India's civilizational receptivity and ability to integrate and assimilate foreign cultures (Nehru 1985, 509). Nehru and Azad saw ICCR as an institution to promote international understanding and peace through interculturalism (Jaffrelot 2011; Mark 2008, 186). The ICCR was established with four goals: to influence India's external

cultural relations policy, promote mutual understanding, facilitate cultural exchange, and reach out to international cultural organizations. Yet, in spite of the lofty vision, its budget each year is small at about USD 47 million, consistent with an international trend of underinvestment in arts and culture (Mundy, 2000). ICCR's operations widened but remained consistent with its original objectives such as scholarships, Indian Cultural Centres overseas, chairs of distinction, fellowships, delegations, and festivals (ICCR, 2017).

The scholarship scheme specifically for developing countries sought to cultivate goodwill among the future world elite (Mark, 2008). Cultural delegations and eminent visitors, such as Joseph Stiglitz, had the purposes of presentation of India and introducing Indian audiences to international thinking (Mark, 2008). Indian Cultural Centres and Chairs of Indian Studies serve both diaspora communities and global academic interest (Mark, 2008). Centres focus either on preserving traditions for Indian diasporas or on promoting intellectual understanding of India in countries with scholarly interest (Thussu, 2016). There are 36 Centres and 70 academic Chairs globally, 20 dedicated to Hindi. In spite of its wide ambit, ICCR is criticized for its conservative cultural representation, lack of contemporary outreach, and limited incorporation of popular culture like Bollywood (Thussu, 2016).

The craft industry and Bollywood, though influential internationally, are not adequately tapped by ICCR. Other criticisms are accusations of favoritism and regional non-inclusiveness (Thussu, 2016). Expert review panels and 20 regional offices were put in place as a response. Still, significant activity is New Delhi-centric, frequently addressing domestic presentations instead of genuine international interaction (Thussu, 2016). After 1970, ICCR became part of the Ministry of External Affairs but never developed a dynamic cultural diplomacy policy (Rana, 2009). Indian Foreign Service dominated leadership, and the funding is ministerial. The 1997 Standing Committee recommended ICCR's increased autonomy to enhance credibility and diminish propagandist images, recognizing the strategic value of cultural diplomacy (Rana, 2009). Essentially, ICCR, with all its affluent vision and diplomatic prowess, is hampered by meagre budgets, conventional methods, and official inefficiencies, and is failing to capitalize fully on India's cultural assets in the international sphere (Rana, 2009).

6. Significant Programs and Schemes Empowering The

Indian Diaspora

Since Prime Minister Narendra Modi, India has revamped its interaction with the Indian diaspora and identifies them as ambassadors of crucial cultural, economic, and political significance (Singh, 2024). Modi calls the diaspora "Rashtradoots" (country ambassadors), indicating the importance placed on their contribution to India's soft power abroad (Singh, 2024). His government has rolled out a range of significant programs to deepen relations and facilitate active diaspora involvement in India's development through political, economic, and cultural channels (Singh, 2024).

1. Pravasi Bharatiya Divas (PBD): Rebirth and Enlargement

PBD was introduced in 2003 but has been rejuvenated under Modi as a leading forum for diaspora interaction. It now encompasses a wider variety of fields such as academia, healthcare, and technology, providing scope for diaspora to interact with policymakers and help shape India's progress (Chaubey, 2024).

2. Strengthening Diaspora Bonds through the Global Pravasi Rishta Portal

This online portal was launched to enhance India's linkage with its international diaspora (Chaubey, 2024). It provides consular services, employment notices, business networking, and cultural activities, enhancing communication and facilitating diaspora inputs to India's development (Chaubey, 2024).

3. Strengthening Overseas Support: The Growth of Consular Services

Consular services have also been enhanced, such as introducing new consulates and easier access to OCI cards and online visa application (Pandit, 2024). These initiatives are intended to provide smooth and effective assistance to diaspora communities, facilitating closer interaction (Pandit, 2024).

4. Vande Bharat Mission: A Lifeline for the Indian Diaspora in Crisis

During the COVID-19 pandemic, more than 1.8 million Indians were repatriated by the Vande Bharat Mission (Ashok, 2024). It highlighted the government's dedication to the well-being of people living abroad and its ability to act effectively in international crises (Mathew, et.al.2025).

5. Leveraging Diaspora for Economic Growth: Key Initiatives and Strategies

The Modi administration actively engaged the diaspora in Indian campaigns including Make in India, Digital India, and Start-up India (Chauhdry, 2024). Its outreach to Indian technologists overseas, particularly Silicon Valley, has encouraged innovation and industrial collaborations in strategic areas such as AI and renewable energy (Chauhdry, 2024).

6. Economic Footprints of the Diaspora: From Remittances to Investments

In 2023, India received \$111 billion in remittances, the highest in the world (Iqbal, et. al, 2024). Apart from remittances, members of the diaspora have contributed to India's technology, education, and start-up systems, integrating themselves further into India's economic scene (Iqbal, et. al, 2024).

7. Indian Diaspora as a Keystone of Soft Power

Modi has used the diaspora to increase India's soft power. International Yoga Day and opening Indian Cultural Centres across the globe popularize Indian culture and cement global linkages (Mazumdar, 2018). The political voice of diaspora groups, particularly in nations such as the US and UK, has contributed to India's global reputation (Mazumdar, 2018).

8. Empowering Indian Diaspora Leaders: Strategic Support in Host Nations

The government has prioritized supporting Indian-origin leaders in politics, business, and civil society (Chaubey, 2024). Their contributions have advanced India's interests and strengthened bilateral ties with their respective host nations (Chaubey, 2024).

9. Promoting Bharatiya Bhasha and Culture: Global Outreach Initiatives

Indian Cultural Centres around the globe now provide important platforms for the promotion of Indian arts, language, and heritage (Pandya, 2025). The government has also increased the promotion of Indian languages, especially Hindi, through events and online media, fostering cultural pride in the diaspora (Pandya, 2025).

10. Education and Ability Progress Strategies

Intrigued by the diaspora's potential in innovation and education, the Modi government has promoted partnership with international educational institutions (Chaubey, 2024). Initiatives such as Skill India welcome diaspora engagement to equip Indian youth. Return Indian students pursuing higher studies abroad are also being actively brought back to India (Pandya, 2025).

11. Collaborative Diplomacy: Diaspora Influence

The Modi administration has strategically used the diaspora's global presence to enhance India's diplomacy (Chaubey, 2024). Whether through advocacy in Washington or professional achievements abroad, the diaspora has helped promote India's foreign policy goals and strengthen international relationships (Chaubey, 2024).

7. Conclusion

There has been a tremendous transformation in Bharat's foreign policy regarding diaspora concerns, especially during Prime Minister Modi's regime. PM Modi activated all modes of diplomacy to connect the diaspora with their homeland and contribute to Bharat's cultural, economic, and political development—an energetic diplomacy that was missing before him. In the post-independence period, however, PM Nehru, due to specific political reasons, excluded the diaspora from the foreign policy framework by referring to them as the "Guest Community." It was only after the 1976 Emergency that the then-leadership began to consider including the diaspora in foreign policymaking. The economic reforms under the 1990s LPG (Liberalization, Privatization, and Globalization) policy compelled the government to recognize the diaspora's economic significance to Bharat's development.

In 1994, a department was created to address diaspora concerns and initiate policy-level interaction with the Bhartiya diaspora community globally. Yet, despite this institutional development, there was no major change in bureaucratic functioning, as it continued in a conventional manner. At times, bureaucracy seemed to follow the Nehruvian attitude of "active dissociation." However, with PM Modi taking charge, he emphasized administrative and policy reforms to effectively engage the diaspora with the homeland. Aware of the diaspora's capital and knowledge potential for Bharat's political, cultural, and economic progress, PM Modi often asserts, "The world's desire to interact with Bharat has increased. Our diaspora can play a crucial role in promoting

Bharat's interaction with the world." Through his governance philosophy of "Sabka Saath, Sabka Vikaas" (taking everyone along and working for everyone's welfare), PM Modi has inspired the diaspora to contribute their capital, skills, and knowledge for Bharat's growth. His 'Diaspora Diplomacy' continues to evolve, positioning the Bhartiya diaspora as a global bridge that connects the world with Bharat for economic development.

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CHAPTER – 8

RECLAIMING THE GURUKUL SYSTEM: HARMONISING INDIGENOUS PEDAGOGIES WITH CONTEMPORARY EDUCATION

DR. SHUBHANSHI
Independent Scholar
SHUATS, Naini, Prayagraj
drshubhanshi13@gmail.com

1.Introduction: Rethinking Education through Indigenous Wisdom

In the 21st century, formal education systems globally are confronting an intensifying crisis of relevance and well-being. Despite the rapid expansion of educational access, learners across contexts report rising levels of stress, emotional exhaustion, academic disengagement, and a pervasive sense of alienation from the learning process (UNESCO, 2021). The emphasis on standardized testing, curriculum rigidity, and quantifiable learning outcomes has inadvertently marginalized the affective, ethical, and contextual dimensions of education. As educational institutions seek to recalibrate learning for a rapidly changing world, a growing body of scholarship calls for a re-engagement with holistic, culturally rooted, and learner-centred pedagogical traditions (Andreotti,

2011; Battiste, 2013).

Within this landscape of re-evaluation, indigenous knowledge systems offer invaluable perspectives. Unlike the industrial-era models that emphasize compartmentalized content delivery and hierarchical teacher-student relations, indigenous pedagogies often embody relational, experiential, and transformative modes of learning (Smith, 2012). These traditions, shaped over centuries within specific cultural and ecological contexts, foster a more integrated understanding of human development—one that transcends the binaries of cognition and emotion, reason and intuition, or knowledge and wisdom. In postcolonial and decolonial discourse, indigenous education is increasingly recognized not merely as a historical artifact but as a vital intellectual tradition that can challenge epistemic dominance and enrich contemporary global pedagogical theory (Mignolo, 2009; Shahjahan, 2012).

In the Indian context, the Gurukul system represents a pre-colonial educational model grounded in Vedic philosophy, characterized by personalized mentorship (Guru-Shishya Parampara), value-based instruction, embodied learning, and deep integration with nature and community life (Prakash & Mukhopadhyay, 2013). Far from being archaic, many of its core principles—such as the Panchakosha framework that nurtures the physical, emotional, intellectual, and spiritual dimensions of a learner—resonate strongly with modern theories of holistic education and socio-emotional learning (Raina, 2020). Furthermore, the Gurukul model offers a counter-narrative to contemporary technocratic paradigms by emphasizing slow learning, ethical reasoning, and teacher-student intimacy. In this light, the Gurukul becomes not simply a relic of the past, but a source of pedagogical resilience and renewal that merits critical engagement and contextual adaptation.

This chapter explores the question: *How can selected principles of the Gurukul system inform and enrich 21st-century education models?* The objective is not to idealize or replicate ancient systems wholesale, but to engage with their philosophical foundations and practical expressions in ways that can complement, critique, and potentially transform dominant paradigms. Specifically, the chapter examines the historical and philosophical roots of the Gurukul system, contrasts it with modern formal education structures, analyzes its resonance within India's contemporary education policy landscape—particularly the National Education Policy (NEP) 2020—and presents illustrative case studies of institutions that embody Gurukul-inspired innovations. Finally, it reflects on

the opportunities and challenges of integrating such indigenous pedagogical elements within diverse educational settings, including technologically mediated and urban contexts.

In doing so, this chapter contributes to the ongoing global dialogue on decolonizing education, restoring epistemic diversity, and designing learning systems that are not only effective but also ethical, inclusive, and sustainable.

2. Historical and Philosophical Foundations of the Gurukul System

India's Gurukul system, deeply rooted in Vedic philosophy, stands as a testament to an educational tradition that conceived learning not as a mechanical acquisition of information but as a sacred, holistic, and life-integrated journey. The system embodied an indigenous epistemology wherein education was inseparable from personal transformation, social harmony, and cosmic alignment. To comprehend the philosophical depth of this model, it is essential to explore its foundational principles: the Panchakosha framework of human development, the Guru-Shishya Parampara (teacher-disciple lineage), life-centric pedagogy, and the socio-ecological matrix that sustained this educational order.

2.1 Vedic Epistemology and the Panchakosha Theory: An Integrated Human Development Model

The Vedas and Upanishads, India's foundational knowledge systems, proposed a layered view of human existence. The *Taittiriya Upanishad* articulated the *Panchakosha* theory—a fivefold conception of the self, consisting of the Annamaya (physical body), Pranamaya (vital life-force), Manomaya (mind and emotions), Vijnanamaya (intellect and wisdom), and Anandamaya (bliss and spiritual consciousness) sheaths (Sarma, 2011). This model provided the philosophical bedrock for the Gurukul pedagogy, guiding educators to cultivate learners holistically across these interdependent domains.

Unlike modern systems that prioritize cognitive growth often at the expense of emotional or spiritual development, the Gurukul approach was inherently integrative. Physical routines (yoga, asanas), ethical disciplines (yama and niyama), dialectical inquiry (tarka and vichara), and meditative practices were all seamlessly embedded into daily learning to support multidimensional growth (Rao, 2014). The Panchakosha framework thus offered a blueprint for nurturing the totality of a human being, aligning education with the pursuit of *purushartha*—the four aims of life: dharma (ethical duty), artha (prosperity),

kama (desire), and moksha (liberation).

2.2 The Guru-Shishya Parampara: Knowledge as Relational and Sacred

At the core of the Gurukul system was the *Guru-Shishya Parampara*—a pedagogical relationship marked by intimacy, reverence, and co-existence. The *guru* (teacher) was not merely an instructor but a guide, philosopher, and exemplar whose authority derived from inner realization rather than institutional certification (Prakash & Mukhopadhyay, 2013). Knowledge (*vidya*) was not considered a commodity to be transmitted; rather, it was a sacred legacy to be awakened through trust, dialogue, and lived experience.

This relationship was situated within a deeply spiritual framework wherein the teacher's ethical conduct, discipline, and embodiment of knowledge played a central role in inspiring the student. The disciple (*shishya*), in turn, committed to *seva* (service), humility, and rigorous self-inquiry. Such an intersubjective model stands in sharp contrast to contemporary education's impersonal and transactional character. Modern mentorship models and contemporary dialogic pedagogy can draw significant inspiration from this relational paradigm (Deshpande, 2019).

2.3 Learning as Life-Centric: Rituals, Nature, Storytelling, and Arts

The Gurukul's curriculum was intrinsically life-centric and interwoven with the rhythms of nature, social rituals, and daily living. Knowledge was not compartmentalized but integrated into all aspects of life—learning occurred in forests (*tapovanas*), homes, or temples, with the natural environment serving as both classroom and curriculum (Bharati, 2010). The presence of *sacred ecology*—where trees, rivers, animals, and seasons were seen as co-teachers—fostered an environmental ethic long before the rise of ecological education.

Pedagogical tools included storytelling (*katha*), chants (*mantras*), debates (*shastrartha*), music, dance, and crafts, which allowed learners to absorb complex ideas through aesthetic and embodied experiences. Rituals and ceremonies served not only spiritual functions but also psychosocial purposes, reinforcing discipline, community belonging, and mindfulness (Raina, 2020). The performative and experiential nature of such learning ensured that education was not a discrete phase of life but a lifelong, integrated process of becoming.

2.4 The Social Ecology of the Gurukul: Inclusion, Community, and

Sustainability

While critics often view ancient Indian education as elitist, historical and textual evidence suggests a more nuanced reality. Several Gurukuls accommodated learners from diverse castes and regions, particularly in Buddhist, Jain, and regional schools (Mookerji, 1951). The communal structure of Gurukuls, often sustained by local contributions and shared labor, reinforced values of cooperation, interdependence, and collective responsibility. Education was thus embedded in a socio-economic ecology where the school was not a separate institution but an organic extension of the community.

Moreover, the sustainability of the Gurukul system lay in its low-resource, high-trust architecture. The model emphasized minimalism, frugality, and ethical self-regulation over institutional expansion and bureaucratic control (Joshi, 2016). As a result, the Gurukul remained adaptive, locally grounded, and deeply resilient—qualities now urgently sought in post-pandemic educational reform discourse. By grounding pedagogy in metaphysical insight, ethical relationships, and ecological sensibility, the Gurukul tradition offers a timeless vision of education as a path toward self-realization, community harmony, and planetary responsibility.

3.Comparative Perspectives: Gurukul vs. Modern Educational Models

The evolution of formal education has seen a shift from personalized, holistic learning traditions to highly systematized, bureaucratized institutions. The ancient Gurukul system and contemporary mass education models represent two epistemologically distinct paradigms of learning. A comparative exploration reveals foundational differences in pedagogical orientation, teacher-student dynamics, curriculum philosophy, and methods of evaluation—differences rooted in broader socio-political and historical processes, particularly the colonial reshaping of indigenous knowledge systems.

3.1Standardization vs. Personalization

Contemporary education systems emphasize standardization: common curricula, age-based grade levels, uniform assessments, and metrics-driven accountability. While standardization aims at scalability and equity, it often neglects the diverse cognitive, emotional, and cultural needs of learners (Darling-Hammond et al., 2019). In contrast, the Gurukul system was inherently personalized. The teacher tailored instruction according to the learner's pace, aptitude, and dharmic inclinations. Education was seen as a

developmental journey rather than a race toward benchmarks.

This personalization was rooted in the *Guru-Shishya* framework, where deep familiarity enabled the guru to nurture latent potential through dialogic engagement, storytelling, and reflective inquiry. Such approaches resonate with contemporary constructivist theories, which advocate learner-centred methodologies as more effective for meaningful learning (Bransford et al., 2000).

3.2 Examination vs. Experiential Learning

Modern education relies heavily on written examinations to assess learning outcomes. These assessments often prioritize recall and rote learning, thereby constraining creativity and deeper understanding (Kumar, 2020). Conversely, the Gurukul system emphasized experiential learning—*anubhava*. Knowledge was applied through rituals, debates, recitation, practical work, and daily duties, blending theory with lived experience. The Vedic learning process was cyclical and reflective, emphasizing internalization over performance. Contemporary pedagogies such as experiential learning theory (Kolb, 1984) and project-based learning echo these traditional methods, recognizing that active engagement enhances retention, motivation, and critical thinking.

3.3 Content-Driven vs. Values-Based Curricula

Mainstream education tends to be content-heavy, focused on information transmission and preparation for economic productivity. Moral education, if present, is often supplemental. In contrast, the Gurukul curriculum was value-centric (*dharm*a-based), with knowledge pursued for self-realization (*moksha*) and societal harmony (*lokasangraha*). Lessons on ethics, self-discipline, compassion, and ecological balance were integrated with intellectual training. Such integration aligns with current global education goals. The UNESCO Futures of Education report (2021) calls for education that develops ethical consciousness, empathy, and planetary responsibility—objectives once organically embedded in the Gurukul tradition.

3.4 Hierarchical vs. Dialogic Teacher-Student Relationships

In mass schooling systems, the teacher often occupies a position of authority, delivering knowledge in one-way, didactic formats. Paulo Freire (1970) famously critiqued this “banking model” of education as alienating and dehumanizing. The Gurukul model, while reverent toward the teacher, fostered an intimate, dialogic, and spiritually charged relationship. The *Guru-Shishya*

dynamic involved mutual respect and a shared commitment to the pursuit of truth (*satya*). Dialogue (*samvada*), questioning, and deep listening were fundamental. This relational pedagogy aligns with modern theories of transformative learning and mentoring that emphasize relational trust and dialogical inquiry (Mezirow, 1991).

3.5 Impact of Colonial Education on Indigenous Pedagogies

The imposition of British colonial education in India marked a pivotal departure from indigenous systems. Macaulay's Minute on Indian Education (1835) institutionalized English-medium, utilitarian instruction modelled on European rationalism. Gurukuls, madrasas, and pathshalas were systematically marginalized and delegitimized (Kumar, 2005). Colonial schooling propagated Eurocentric epistemologies, dislocating Indian learners from their linguistic, cultural, and philosophical moorings. This epistemicide (de Sousa Santos, 2014) continues to echo in the undervaluation of traditional knowledge in curricula and teacher training.

Table 1: Key Differences between Gurukul and Modern Educational Models

Dimension	Gurukul System	Modern Education System
Pedagogy	Personalized, holistic, experiential	Standardized, segmented, test-oriented
Assessment	Continuous, oral, reflective	Periodic, written, summative
Curriculum	Values-based, integrated with life	Content-heavy, abstract, discipline-specific
Teacher-Student Relation	Dialogic, sacred, mentorship-based	Hierarchical, transactional
Purpose of Education	Self-realization, ethical development	Employment, economic productivity
Learning Context	Natural, community-based, embodied	Institutional, urban, disembodied

Table 1 illustrate Gurukul and modern education systems represent fundamentally different orientations toward the purpose, process, and philosophy of education. Recognizing the limitations of purely standardized, exam-driven learning, there is a growing impetus to recover indigenous insights and harmonize them with contemporary needs. The Gurukul tradition, when engaged critically, offers valuable resources for rethinking pedagogy as a

relational, ethical, and life-affirming practice.

4. Gurukul Elements in Contemporary Indian Policies and Practices

The Gurukul system, rooted in India's Vedic traditions, emphasized holistic education that integrated ethical values, physical health, intellectual development, and spiritual growth. While the colonial education model displaced many indigenous systems, contemporary India—particularly through the *National Education Policy (NEP) 2020*—is witnessing a strategic shift towards reintegrating elements of this ancient philosophy into the modern pedagogical framework. This policy transition signals an epistemological rebalancing that values rootedness in culture and context alongside global competencies.

4.1 National Education Policy 2020: Philosophical Alignment with Gurukul Principles

The NEP 2020 represents a paradigmatic departure from earlier education policies that prioritized exam-driven learning and Eurocentric curricula. Its vision echoes foundational principles of the Gurukul system, emphasizing holistic development, experiential learning, value inculcation, and multidisciplinary education (Ministry of Education, 2020). The policy explicitly calls for nurturing the “five facets of education”—intellectual, physical, emotional, moral, and spiritual—resonating strongly with the *Panchakosha* framework of the Gurukul model (Raina, 2021). Further, the NEP's focus on *foundational literacy and numeracy, ethics and human values, and critical thinking* can be seen as a modern rearticulation of the Gurukul aim of achieving *vidya*—true wisdom that enables personal and societal transformation (Rao, 2020). Its embrace of lifelong learning and flexibility in academic pathways reflects the non-linear, self-paced nature of the Gurukul tradition.

4.2 Integration of Life Skills, Arts, Yoga, Meditation, and Mother-Tongue Learning

One of the most salient features of NEP 2020 is its emphasis on integrating life skills, artistic expression, physical education, and mindfulness practices into the mainstream curriculum—core components of the Gurukul system. Ancient education integrated disciplines such as *yoga, sangeet* (music), *natya* (drama), and *kala* (crafts) not as extracurriculars but as central to character formation and emotional intelligence (Bharati, 2010).

Modern neuroscience supports this approach: practices like yoga and

meditation enhance executive functioning, emotional regulation, and resilience in students (Telles & Singh, 2018). The NEP mandates the inclusion of these elements at all levels of schooling, aligning contemporary education with embodied learning traditions of the Gurukul.

The policy's directive to use the mother tongue or regional language as the medium of instruction up to Grade 5—preferably till Grade 8—is also deeply rooted in indigenous pedagogy. The Gurukul system emphasized learning in Sanskrit or the regional vernacular, facilitating conceptual clarity and cultural relevance. Research affirms that early education in the mother tongue supports cognitive development and improves learning outcomes (UNESCO, 2021).

4.3 Promoting Local Knowledge, Vocational Education, and Moral Reasoning

The Gurukul model recognized local, contextual knowledge—agriculture, astronomy, architecture, medicine, and music—as vital forms of *vidya*. NEP 2020 revitalizes this approach by encouraging schools to integrate local traditions, folk arts, crafts, and indigenous ecological practices into their curricula. This aligns with *Bharatiya Gyan Parampara*—the Indian knowledge systems framework now promoted in higher education institutions.

Furthermore, the policy promotes vocational education from Grade 6 onwards, with mandatory internships and practical exposure. This shift echoes the Gurukul practice of hands-on learning (*karmayoga*) through community participation and craft-based education.

Equally significant is NEP's emphasis on value-based education, or *Samskaras*. It recommends integrating themes of ethics, empathy, environmental stewardship, and constitutional values across disciplines. This initiative corresponds with the *dharm*-centred ethics embedded in the Gurukul curriculum, wherein moral reasoning was cultivated through storytelling, reflection, and lived experiences (Mukhopadhyay & Prakash, 2013).

4.4 Revisiting Teacher Autonomy and Mentorship Models

The NEP underscores the importance of empowering teachers as mentors, facilitators, and knowledge creators—an idea central to the *Guru-Shishya Parampara*. Unlike the current technocratic models that often reduce teachers to content deliverers, the Gurukul system revered the *guru* as a transformative agent whose life was as educative as their instruction (Deshpande, 2019).

The policy proposes professional development models that prioritize teacher autonomy, school-based leadership, and continuous learning, aligning with the Gurukul ethos of self-discipline (*svadhyaya*) and reflective practice. Moreover, NEP's call to establish National Professional Standards for Teachers (NPST) based on holistic competencies reflects a shift from bureaucratic control to pedagogical integrity.

Table 2: Alignment of Gurukul Elements with NEP 2020 Provisions

Gurukul Principle	NEP 2020 Alignment
Panchakosha-based holistic development	Emphasis on cognitive, emotional, physical, and spiritual growth
Guru-Shishya mentorship	Empowering teachers as mentors and facilitators
Experiential and vocational learning	Skill-based education from Grade 6; internships and practicals
Value-based, ethical education	Integration of ethics and constitutional values across curriculum
Language of instruction in mother tongue	Primary education in regional languages for conceptual clarity
Arts, yoga, and life skills as core	Mainstreaming art, yoga, and life skills across school levels

Table 2 illustrates the National Education Policy 2020 marks a conscious reclamation of India's educational heritage. By embedding Gurukul principles into a modern, pluralistic, and inclusive framework, the policy attempts to harmonize the best of ancient wisdom with the demands of contemporary society. While implementation challenges persist, the philosophical reorientation towards holistic, value-based, and culturally grounded education is a promising step toward pedagogical justice and innovation.

5. Case Studies: Contemporary Educational Institutions Inspired by Gurukul Ideals

While the ancient Gurukul system no longer exists in its traditional form, its pedagogical essence continues to influence contemporary Indian education through innovative schooling models that emphasize holistic development, teacher-student intimacy, spiritual growth, and environmental consciousness. This section presents four case studies of institutions that draw inspiration from

Gurukul ideals and have adapted them meaningfully into 21st-century educational contexts.

5.1 Rishi Valley School (Krishnamurti Foundation): Blending Academic Rigor with Mindfulness

Founded by philosopher J. Krishnamurti in 1926, Rishi Valley School in Andhra Pradesh exemplifies a contemporary reinterpretation of the Gurukul ethos. The institution emphasizes non-competitive learning, self-inquiry, and dialogic engagement, much like the reflective spirit of the *Guru-Shishya Parampara*.

Classes are designed to foster inner awareness, ethical reflection, and aesthetic appreciation alongside academic excellence (Jayakar, 2002). Students engage in meditation, ecological restoration projects, and community-based learning, integrating mindfulness into their daily routines. The curriculum avoids rankings and excessive testing, allowing for individual pacing and creative exploration—core principles of Gurukul pedagogy.

Notably, the school's *Rural Education Centre* also trains teachers in multigrade and multilingual methodologies to support underserved communities, echoing the Gurukul's inclusive, socially embedded nature (Rishi Valley Education Centre, 2019).

5.2 Sadhna School (Himachal Pradesh): Community-Based, Ecological Learning

Located in the ecologically sensitive region of Himachal Pradesh, Sadhna School combines community-rooted learning with ecological stewardship. Established as a response to the limitations of centralized, textbook-driven curricula, the school emphasizes hands-on education, local culture, and environmental ethics.

Children participate in farming, carpentry, storytelling, and performing arts—practices reminiscent of ancient Gurukuls where learners acquired wisdom through *anubhava* (experience) rather than abstraction (Joshi, 2016). The school operates on a non-hierarchical model where teachers and students co-create the learning environment, blurring the boundary between formal instruction and everyday life.

Importantly, Sadhna's place-based pedagogy draws on the traditional

ecological knowledge (TEK) of indigenous communities. As Berkes (2018) observes, TEK-based schooling nurtures a sense of ecological literacy and intergenerational knowledge transmission, essential for sustainable development.

5.3 Isha Vidhya and Chinmaya Vidyalayas: Spirituality and Value-Based Education

The Isha Vidhya rural schools, an initiative by the Isha Foundation, aim to provide affordable, value-centred education to underprivileged children in Tamil Nadu and other states. While emphasizing modern STEM education, the schools integrate yoga, meditation, and vernacular instruction, aligning with the Gurukul's emphasis on mind-body balance and cultural rootedness (Sadhguru, 2018). Similarly, Chinmaya Vidyalayas, inspired by the teachings of Swami Chinmayananda, incorporate Vedantic philosophy, moral instruction, and daily spiritual practices within a CBSE framework. Students are encouraged to explore Indian scriptures, chant verses, and engage in community service—practices designed to build ethical consciousness and emotional resilience (Narayanan, 2019). Both institutions reflect the Gurukul model's integrated view of education—where intellectual learning is not divorced from spiritual evolution and social responsibility.

Table 3 highlights how select Indian educational institutions have integrated core elements of the traditional Gurukul system into their pedagogical frameworks.

Table 3: Gurukul-Inspired Elements in Contemporary Indian Schools

Institution	Core Gurukul Elements Reflected	Outcomes
Rishi Valley School	Dialogic learning, mindfulness, teacher-student intimacy	Student autonomy, reduced academic anxiety, ethical insight
Sadhna School	Nature-based, experiential learning, community participation	Ecological awareness, cultural rootedness
Isha Vidhya	Yoga, rural inclusion, mother-tongue instruction	Improved well-being, local empowerment
Chinmaya Vidyalayas	Value education, Vedantic studies, spiritual reflection	Moral reasoning, emotional intelligence

5.4 Comparative Outcomes: Student Well-being, Community Engagement, and Cognitive Growth

Studies and qualitative evaluations from these schools reveal promising outcomes across multiple dimensions of student development as represented in Figure 1.

Emotional well-being: Practices such as meditation, nature immersion, and value-based reflection help reduce stress, enhance self-regulation, and build emotional intelligence (Telles et al., 2019).

Cognitive growth: Individualized instruction and project-based learning enhance critical thinking, retention, and application of knowledge beyond rote memorization (NCERT, 2020).

Community engagement: Curricula grounded in local knowledge and cooperative tasks foster social skills, collective identity, and civic responsibility, in line with the Gurukul principle of *lokasangraha* (social harmony).

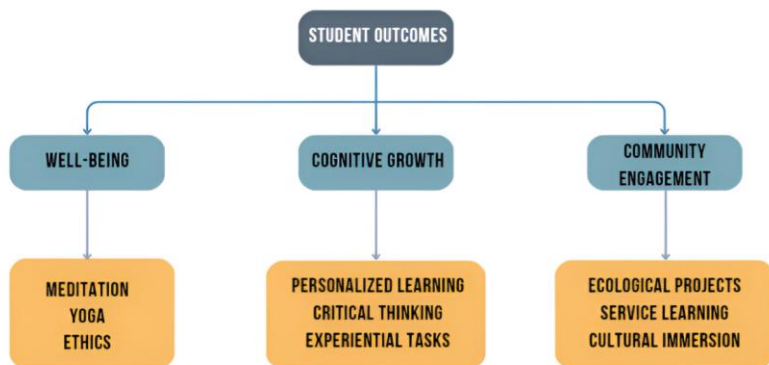


Figure 1: Interconnected dimensions of student development in Gurukul-inspired institutions.

In essence, these case studies illustrate that the Gurukul ethos is not only historically significant but pedagogically viable in the contemporary context. While each institution adapts the tradition uniquely, their collective success challenges the mainstream assumption that holistic, values-based, and relational education cannot be scaled or assessed. By revisiting the wisdom of India's indigenous pedagogy, these schools present a transformative model of learning that aligns with both ancient insight and modern educational imperatives.

6. Pedagogical Innovations: Reconstructing Gurukul Principles in Digital and Urban Contexts

In an age marked by rapid urbanization and technological immersion, the ancient Gurukul pedagogy—centred on human intimacy, experiential learning, and spiritual introspection—faces the dual challenge of preservation and transformation. The contemporary digital landscape, however, also offers fertile ground for innovation. This section explores how core principles of the Gurukul system are being reconstructed through digital pedagogies and urban educational models, assessing both their transformative potential and inherent critiques.

6.1 Virtual Guru-Shishya Models: E-Mentorship and Reflective Dialogue

The sacred dyadic relationship of the *Guru-Shishya Parampara* is being reimaged through e-mentorship platforms, synchronous learning technologies, and dialogic forums. Initiatives such as *EduMentor*, *Vedantu*, and *Classplus* now allow individualized guidance through one-on-one virtual sessions, resembling the focused and personalized nature of Gurukul instruction (Saxena, 2022).

Moreover, platforms like *Mentza* and *Clubhouse* host voice-based discussions on topics ranging from Vedantic philosophy to ethical dilemmas, promoting introspective discourse and dialogic learning—a pedagogical mode aligned with Vedic *shravan* and *manan* (listening and reflection) processes (Narasimhan, 2021).

However, maintaining the sacred trust and continuity inherent in traditional mentorship models remains a critical challenge in virtual settings, particularly where interactions are monetized or overly transactional.

6.2 Digital Experiential Learning: AI, AR/VR, and Gamified Vedic Content

Emerging technologies like Artificial Intelligence (AI), Augmented Reality (AR), and Virtual Reality (VR) are enabling immersive, experiential forms of learning rooted in Indian epistemologies. Projects such as *Bharat Darshan AR*, *AI-Veda*, and *Heritage VR Classrooms* provide students the opportunity to explore Vedic cosmology, ancient rituals, and Sanskrit phonetics in virtual temples or gurukuls (Rajagopal & Murthy, 2023).

Gamified learning platforms such as *KabaniBox* and *VedaPathshala* integrate Indian storytelling traditions, ethical parables from the *Upanishads*, and ecological lessons from the *Puranas*, fostering both moral reasoning and cognitive engagement. These approaches reflect the life-integrated, arts-based pedagogy that characterized ancient Gurukuls (Joshi, 2016).

Yet, critics caution that gamification must preserve epistemic authenticity and not reduce spiritual texts into commodified trivia, risking a dilution of sacred content (Mukherjee, 2022).

6.3 Mindfulness Technologies: Yoga, Values, and Ecological Literacy

Modern platforms such as *Sattva*, *Art of Living App*, and *ThinkRight.me* leverage mobile technologies to teach mindfulness, yoga, and ethical living, aligning with the Panchakosha model of integrated development. These tools enable urban learners—often disconnected from nature and tradition—to reconnect with embodied wisdom and moral introspection, mirroring Gurukul goals of developing a harmonious self (Telles et al., 2020).

Additionally, e-learning modules offered by *Swadhyaya Learning* and *Digital India Bhasha Portals* promote vernacular education, moral dialogues, and ecological stewardship, often in collaboration with state policies aligned with the National Education Policy (NEP) 2020 (Ministry of Education, 2020).

6.4 Critiques and Limitations: Access and Authenticity

While these innovations have expanded the reach of Gurukul-inspired education, they also pose significant challenges:

- **Commercialization of spiritual content** risks transforming sacred knowledge into consumer products, severing it from its contemplative and ethical roots.
- **Digital access disparities**—especially among rural and marginalized communities—undermine the inclusive intent of the Gurukul model, which historically emphasized accessibility and community integration (Sharma & Shukla, 2021).
- **Algorithmic bias** in AI-based learning systems may further entrench epistemic hierarchies, favouring certain interpretations of Indian wisdom over others.

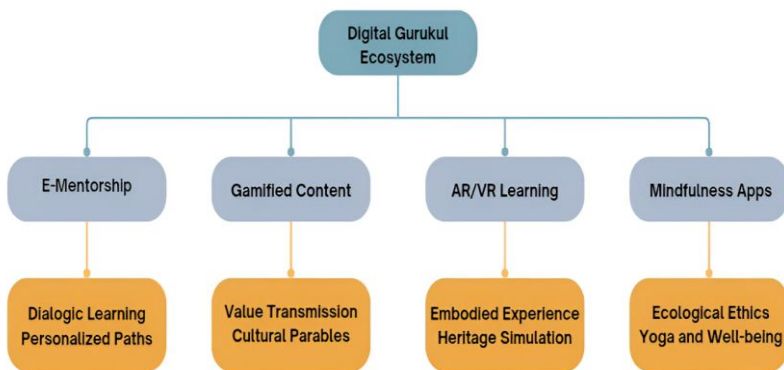


Figure 2: Digital reconstructions of Gurukul pedagogical elements across platforms.

Figure 2 illustrates how foundational elements of the Gurukul system are being transformed in the digital era. The Guru-Shishya relationship finds new expression in synchronous e-mentorship platforms like Vedantu. Experiential learning is revived through AR/VR tools and AI-based Vedic simulations such as Bharat Darshan AR. Value-based education leverages gamified storytelling via platforms like KahaniBox. Yogic and spiritual practices are being delivered through mindfulness apps like ThinkRight.me. Finally, vernacular literacy and cultural education are supported by regional platforms such as Digital India Bhasha Portals, promoting inclusivity and rooted learning.

In conclusion, pedagogical innovations rooted in digital reimagining of Gurukul principles offer promising avenues for revitalizing indigenous knowledge in urban contexts. However, a critical pedagogical lens is essential to ensure that such innovations do not merely replicate the efficiency-driven logics of contemporary education but instead nurture mindful, ethical, and contextually embedded learning.

7.Challenges and Limitations in Integrating Gurukul Ethos Today

Despite the philosophical richness and pedagogical depth of the Gurukul tradition, its integration into contemporary education poses multiple challenges. While the model inspires a holistic and value-centric alternative to standardized schooling, practical, structural, and epistemic barriers impede its scalable

application.

7.1 Scalability and Inclusivity of Personalized Mentorship

One of the hallmarks of the Gurukul system—the *Guru-Shishya* relationship—relies on intimate, sustained mentorship, which is inherently difficult to scale in today’s mass education systems. With classrooms often accommodating 40–60 students, especially in public schools, maintaining individualized attention becomes unfeasible (Srivastava, 2021). Moreover, this relational model demands emotional and intellectual labour from teachers that contemporary institutional structures neither support nor reward adequately.

Additionally, while Gurukuls historically included students from diverse backgrounds, they were not immune to social hierarchies, including gender exclusions and caste-based access barriers. Reintegrating Gurukul principles today must be accompanied by explicit inclusion frameworks to avoid replicating historical inequities (Subrahmanian, 2020).

7.2 Teacher Preparation and Philosophical Grounding

Modern teacher training programs often emphasize procedural efficiency over philosophical depth or cultural rootedness. Few teacher education curricula include Indian epistemologies, Vedic psychology (*Panchakosha*), or value-based dialogic pedagogies (Pathania & Aggarwal, 2019). Without foundational grounding, teachers may find it difficult to embody the roles of ethical mentors, spiritual guides, and holistic facilitators expected in Gurukul-inspired models.

7.3 Curriculum Rigidity and Assessment Standardization

India’s schooling system, while undergoing reforms under the National Education Policy (NEP) 2020, continues to be shaped by exam-centric culture, uniform curricula, and time-bound syllabi. This rigidity leaves little room for the experiential, dialogic, and contemplative practices characteristic of Gurukul pedagogy (Kumar, 2018). Innovative modules such as yoga, meditation, and storytelling are often tokenistic additions rather than integrative components of core instruction.

7.4 Romanticizing Tradition Without Critical Adaptation

A significant risk in reviving Gurukul traditions lies in uncritical idealization. While the system offers timeless wisdom, reproducing it without adapting to present-day socio-political realities—such as pluralism, democratic education,

and gender parity—may result in cultural nostalgia rather than transformative practice (Mohan, 2022). A critical approach must differentiate transcendent pedagogical values from historical socio-religious structures.

Figure 3 highlights four major barriers: the difficulty of scaling personalized mentorship in large classrooms, the lack of philosophical depth in teacher training, rigid curricula and assessment systems that limit experiential learning, and the risk of romanticizing traditional practices without critical adaptation. Together, these challenges emphasize the need for balanced reforms that preserve the essence of indigenous pedagogy while aligning it with contemporary educational realities.

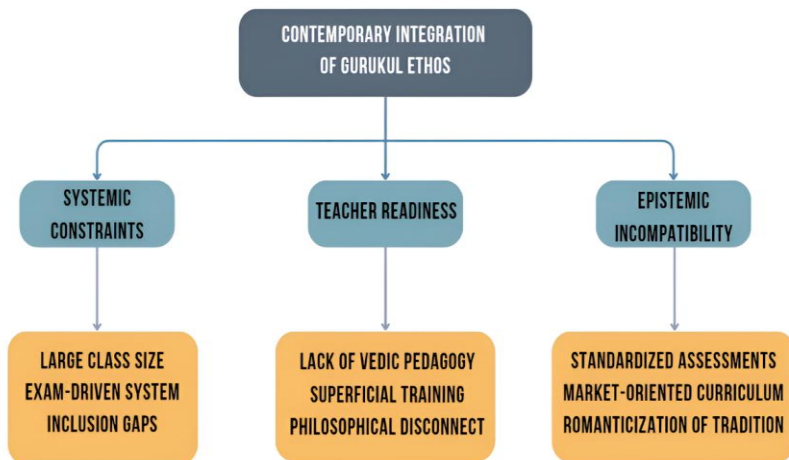


Figure 3: Key challenges in aligning Gurukul pedagogy with modern education systems.

8. Policy, Pedagogy, and Research Recommendations

In order to meaningfully revitalize the Gurukul ethos in modern educational contexts, a multidimensional strategy encompassing teacher education, curricular design, funding, and research is required. These interventions must go beyond tokenistic inclusion and aim for systemic transformation grounded in the philosophical depth of indigenous knowledge systems.

8.1 Reforming Teacher Education: Embedding Cultural and Philosophical Foundations

To implement Gurukul-inspired practices effectively, teacher training must

be restructured to include philosophical grounding in Indian epistemologies, especially concepts like *Panchakosha*, *Dharma*, and the *Guru-Shishya Parampara*. Present-day teacher preparation focuses predominantly on transactional methodologies, often neglecting affective and ethical dimensions of teaching (Pathania & Aggarwal, 2019). Institutions such as the National Council for Teacher Education (NCTE) should embed Indian knowledge systems (IKS) modules across pre-service and in-service programs, integrating contemplative pedagogy, community immersion, and mentorship ethics.

8.2 Promoting Interdisciplinary Research on Indigenous Pedagogy and Child Development

Indigenous models of education, including the Gurukul system, require empirical validation in contemporary contexts. There is a pressing need for interdisciplinary research that draws from psychology, anthropology, linguistics, and education studies to examine how Gurukul principles affect child cognition, emotional intelligence, moral development, and ecological consciousness (Sahoo & Venkatesan, 2020). Research centres such as the Indian Council of Social Science Research (ICSSR) and the National Education Policy Research Units can support this through grants, fellowships, and action-research platforms.

8.3 Flexible and Holistic Curricula

Current standardized curricula leave little room for context-sensitive, values-based, and experiential learning, which are central to the Gurukul model. Curriculum reform must allow for modular, interdisciplinary content aligned with local knowledge, spiritual inquiry, and artistic expression (Kumar, 2018). Schools should be empowered to adapt content based on community needs, thus fostering a deeper connection between learners and their sociocultural environments.

8.4 Sustainable Funding for Alternative Models

To operationalize such changes, public and private funding models must support community-led schools, forest schools, and non-formal learning centres that adopt Gurukul ideals. Philanthropic agencies, CSR initiatives, and government schemes like *Rashtriya Avishkar Abhiyan* can be harnessed to scale these innovations equitably (Jandhyala, 2022).

Figure 4 illustrates strategic pathways for integrating Gurukul-inspired pedagogy into modern education through policy, practice, and research. It

emphasizes reforms in teacher education rooted in cultural and philosophical traditions, development of flexible and holistic curricula, encouragement of interdisciplinary research on indigenous knowledge systems, and the creation of sustainable funding models for alternative and community-based schools. The figure underscores a systems-level approach to harmonize ancient wisdom with future-ready learning frameworks.

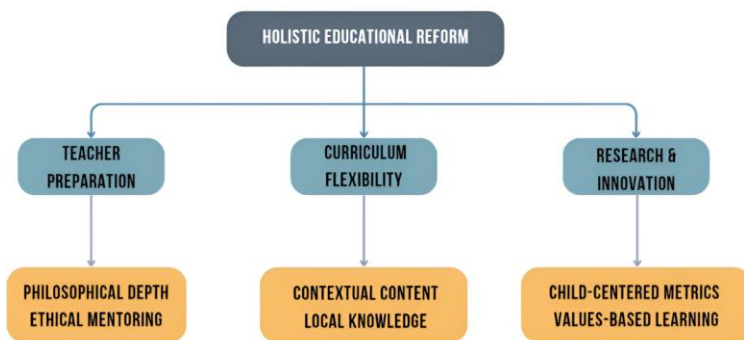


Figure 4: Systemic levers to integrate Gurukul pedagogy in modern contexts.

9. Conclusion: Toward a Synthesis of Ancient Wisdom and Future Learning

The Gurukul system, rooted in Vedic philosophy and centuries-old experiential traditions, offers a compelling counterpoint to the mechanistic, exam-driven, and fragmented educational models prevalent today. As this chapter has explored, Gurukul principles—such as the *Guru-Shishya* relational ethos, *Panchakosha*-based holistic development, and the integration of moral, ecological, and spiritual wisdom—resonate powerfully with the 21st-century imperative to humanize and decentralize education.

At a time when global education is grappling with stress, disconnection, and meaninglessness (UNESCO, 2022), the Gurukul model invites us to reimagine learning as a life-centric, purpose-driven process. It promotes not only cognitive skills but also compassion, ethical discernment, and ecological sensitivity—traits essential for nurturing future citizens of a complex, interdependent world (Radhakrishnan, 2021). Its pedagogical foundations challenge the hegemony of neoliberal metrics and encourage a broader paradigm that places the learner's inner development and social responsibility at the centre.

However, revitalizing Gurukul ethos in modern contexts is not about replicating a bygone era but co-constructing future-ready education through a thoughtful synthesis. It requires critically reinterpreting ancient wisdom in light of contemporary challenges—technological, socio-political, and ecological—and embedding it within inclusive, adaptive, and democratic frameworks (Sripati, 2020). This entails cross-sector collaboration between policymakers, educators, researchers, and communities to create learning ecosystems that are culturally rooted yet globally responsive.

Ultimately, reclaiming ancestral pedagogies is an act of educational decolonization—one that honours plural knowledge traditions while empowering learners to act with integrity, empathy, and awareness. In this synthesis lies the promise of a more humane, resilient, and equitable educational future.

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CHAPTER – 9

FAMOUS INDIAN STATISTICIANS AND THEIR CONTRIBUTIONS TO INDIAN STATISTICS

Dr. STHITADHI DAS
Assistant Professor
Department of Mathematics, Brainware University

1. Introduction

The discipline of statistics, often described as the science of data, has been instrumental in shaping decision-making processes in government, industry, and scientific research. From designing experiments to evaluating public health interventions, and from analyzing economic trends to decoding genetic data, statistics has grown to be an essential tool in the modern world. While the global development of this field has seen contributions from many countries, India has played a particularly unique and influential role, producing some of the most revered statisticians in history.

The story of Indian statistics is not just about numbers or equations—it is a narrative of visionary thinkers, institution builders, and pioneers who laid the foundation for data-driven inquiry long before it became a global imperative. Indian statisticians have not only advanced theoretical frameworks but also

pioneered practical applications that have had lasting societal impacts. Their work has facilitated major developments in sample survey methodology, multivariate analysis, Bayesian inference, spatial data modeling, and experimental design.

The legacy begins with Prasanta Chandra Mahalanobis, who institutionalized the use of statistics in Indian governance by founding the Indian Statistical Institute (ISI) and introducing large-scale surveys. His contemporaries and successors—like C.R. Rao, R.C. Bose and S.N. Roy further expanded the frontiers of statistical knowledge and shaped the field on an international scale. Later generations, including Jayanta Kumar Ghosh, Malay Ghosh, and Sudipto Banerjee, continued this tradition of excellence, ensuring that Indian contributions remained at the cutting edge of global statistical research.

In this chapter, we explore the profound achievements of these great minds—not merely to honor them, but to understand the significance of their ideas and their continuing relevance in the data-rich world we inhabit today. Through their stories, we gain insight into the intellectual foundations and practical innovations that have defined the Indian statistical tradition.

2. Prasanta Chandra Mahalanobis (1893–1972)

Prasanta Chandra Mahalanobis stands tall among the pioneers of statistics in India. Born on June 29, 1893, in Kolkata (then Calcutta), Mahalanobis was a polymath with a deep interest in science, mathematics, and social issues. He completed his education at Presidency College, Calcutta, and later at King's College, Cambridge, where his exposure to the journal *Biometrika* ignited his passion for statistics.

Mahalanobis is best remembered for introducing the Mahalanobis distance, a multivariate metric used to measure the distance between a point and a distribution. This measure has found applications across disciplines, including pattern recognition, cluster analysis, and classification in machine learning. It remains a cornerstone in multivariate statistical theory.

However, Mahalanobis's contributions extend far beyond theoretical formulations. He was a visionary institution builder who recognized the importance of statistics in national planning and policy-making. In 1931, he founded the Indian Statistical Institute (ISI), which became a globally renowned center for statistical research and education. Under his leadership, ISI nurtured

generations of statisticians, including the legendary C.R. Rao.

Another of his landmark achievements was the establishment of the National Sample Survey (NSS) in 1950, which revolutionized data collection and social research in India. By introducing large-scale sample surveys, Mahalanobis ensured that policy makers could rely on empirical data for decision making. He also played a central role in formulating India's second five-year plan, where he developed the Mahalanobis model, an input-output economic model focused on rapid industrialization. This plan significantly shaped India's early economic development trajectory.

Mahalanobis' impact was not limited to academia or national policy; he was a global figure who served as a statistical advisor to multiple international bodies, including UNESCO and the United Nations. His efforts laid the foundation for the integration of statistical thinking into governance and scientific progress. In recognition of his contributions, Mahalanobis received numerous accolades, including Padma Vibhushan in 1968. His birthday, June 29, is celebrated in India as National Statistics Day in his honor.

Mahalanobis was not only a statistician but a visionary leader whose interdisciplinary approach bridged the gap between theory and application. His legacy continues to inspire statisticians, data scientists, and policymakers.

3. Calyampudi Radhakrishna Rao (1920–2023)

Calyampudi Radhakrishna Rao, widely known as C. R. Rao, was a pioneering Indian-American statistician whose foundational work has profoundly influenced the field of statistics. Born on September 10, 1920, in Huvina Hadagali, Karnataka, India, Rao's contributions have left an indelible mark on statistical theory and its applications across various disciplines. He passed away on August 22, 2023, at the age of 102.

Rao completed his early education in mathematics at Andhra University, earning a bachelor's degree in 1939 and a master's degree in 1940. He then pursued a master's degree in statistics from the University of Calcutta in 1943. Rao obtained his Ph.D. from King's College, Cambridge, in 1948 under the supervision of Ronald Fisher. Later, in 1965, he was awarded the prestigious Sc.D. degree from Cambridge University .

Rao's work has been instrumental in shaping modern statistical theory.

Some of his most significant contributions include:

- **Cramér-Rao Bound:** A fundamental result providing a lower bound on the variance of unbiased estimators, establishing a benchmark for estimator efficiency.
- **Rao-Blackwell Theorem:** Developed independently by Rao and David Blackwell, this theorem offers a method to improve estimators by conditioning on sufficient statistics.
- **Fisher-Rao Metric:** A Riemannian metric foundational to information geometry, with applications in statistical inference and machine learning.
- **Orthogonal Arrays:** Introduced by Rao in 1947, these are used in the design of experiments to study the effects of multiple factors efficiently.
- **Generalized Inverses:** Rao defined the generalized inverse (g-inverse) of a matrix, which has applications in linear models and multivariate analysis.

Beyond these, Rao's work extended to multivariate analysis, estimation theory, differential geometry, and the development of statistical methods applicable to fields such as genetics, neuroscience, and machine learning. Rao's career spanned several prestigious institutions:

- **Indian Statistical Institute (ISI):** Rao served as the Head and later Director of the Research and Training School at ISI for over 40 years, playing a pivotal role in developing research and training programs that positioned India prominently on the global statistical map .
- **University of Pittsburgh and Pennsylvania State University:** After moving to the United States, Rao held professorial positions at these institutions, contributing to research and mentoring students.
- **University at Buffalo:** In his later years, Rao was a professor in the Department of Biostatistics at the University at Buffalo's School of Public Health and Health Professions .

Rao also served as president of several major statistical organizations, including the International Statistical Institute, the Institute of Mathematical

Statistics, and the International Biometric Society .

Rao's exceptional contributions have been recognized with numerous awards and honors:

- **Padma Bhushan (1968) and Padma Vibhushan (2001):** Among India's highest civilian honors.

- **Shanti Swarup Bhatnagar Award (1963):** For notable and outstanding research in statistics.

- **National Medal of Science (2002):** The highest scientific honor in the United States, awarded for his pioneering contributions to statistical theory.

- **Guy Medal in Silver (1965) and Guy Medal in Gold (2011):** Awarded by the Royal Statistical Society, with Rao being the first non-European and non-American recipient of the Gold medal.

- **International Prize in Statistics (2023):** Often regarded as the "Nobel Prize of Statistics," recognizing his significant contributions to the discipline.

- **Fellow of the Royal Society (1967):** One of the highest honors a scientist can receive.

Additionally, Rao received 38 honorary doctoral degrees from universities in 19 countries and was a member of eight national academies across India, the United Kingdom, the United States, and Italy.

C. R. Rao's legacy extends beyond his theoretical contributions. He was instrumental in developing India's national statistical system, working under the direction of P.C. Mahalanobis to set up state statistical bureaus and a network of statistical agencies at the district level . He founded the Indian Econometric Society and the Indian Society for Medical Statistics, promoting quantitative studies in economics and medical research.

Rao authored 15 books and over 400 research papers, with his works translated into multiple languages, influencing generations of statisticians worldwide. His mentorship produced over 50 Ph.D. students, many of whom became leading figures in the field.

Institutions and awards have been named in his honor, including the C.R. Rao Advanced Institute of Mathematics, Statistics and Computer Science in Hyderabad and the biennial 'The Professor C.R. Rao' Award instituted by the Government of India to recognize outstanding contributions in statistics.

Rao's profound impact on statistics and its applications across various domains ensures that his legacy will endure for generations to come.

4. Raj Chandra Bose (1901–1987)

Raj Chandra Bose was a distinguished Indian-American mathematician and statistician, renowned for his fundamental contributions to design theory, finite geometry, and error-correcting codes. Born on June 19, 1901, in Hosangabad, India, and passing away on October 31, 1987, Bose's mathematical innovations have had a lasting impact on both theoretical and applied mathematics.

Bose earned his M.A. in pure mathematics from the University of Calcutta. Despite facing personal and financial difficulties, he pursued his academic career with great determination. His early career began under the guidance of P. C. Mahalanobis at the Indian Statistical Institute (ISI), where he would later influence generations of statisticians, including C. R. Rao.

Raj Chandra Bose is best known for:

- **Design Theory:** Bose made groundbreaking contributions to combinatorial design theory, particularly in block designs and symmetric designs.

- **Finite Geometry:** He introduced and developed several concepts in finite projective and affine planes, which have become foundational in the field.

- **Error-Correcting Codes:** He co-invented the BCH codes (Bose–Chaudhuri–Hocquenghem codes), which are crucial in digital communication and data storage systems.

- **Mathematical Structures:** Bose's work in algebraic and statistical structures has influenced research in cryptography, coding theory, and information systems.

After a significant period at ISI, Bose moved to the United States and held academic positions, most notably at the University of North Carolina at Chapel Hill. He was highly respected not only for his research but also for his mentorship and leadership in academia.

Raj Chandra Bose's work laid the groundwork for many modern technological applications, particularly in information theory and statistical design. His mathematical creativity and perseverance continue to inspire mathematicians and statisticians around the world.

5. Samarendra Nath Roy (1906–1964)

Samarendra Nath Roy was a distinguished Indian statistician and mathematician, widely recognized for his seminal work in multivariate analysis and the application of matrix theory in statistics. Born in 1906, Roy played a foundational role in shaping statistical theory during its formative years, especially in the context of multivariate distributions. He passed away in 1964.

Roy earned his early degrees from Calcutta University, where he also came under the mentorship of Prasanta Chandra Mahalanobis. He became closely associated with the Indian Statistical Institute (ISI), contributing immensely to its academic rigor and global reputation. Roy later pursued higher studies and research abroad, including work in the United States.

Roy's research was pivotal in developing the theoretical backbone of multivariate statistical analysis. His major contributions include:

- **Multivariate Analysis:** Roy was one of the early pioneers to systematize multivariate statistical methods, especially canonical correlation analysis.

- **Roy's Largest Root Test:** This statistical test is used for hypothesis testing in multivariate analysis, particularly in the context of the likelihood ratio test.

- **Matrix Algebra in Statistics:** He advanced the use of matrix algebra in theoretical statistics, making the mathematical framework more robust and applicable.

- **Statistical Education and Training:** Roy was deeply involved in building statistical curricula and mentoring future statisticians, significantly influencing academic training in India and abroad.

Roy held key academic and administrative positions at the Indian Statistical Institute. He also worked at several universities and research institutions internationally, including in the United States, further strengthening cross-national academic collaboration.

Samarendra Nath Roy's legacy is embedded in the very foundations of modern multivariate statistics. His rigorous theoretical work and contributions to statistical education continue to influence generations of statisticians.

6. J. B. S. Haldane (1892–1964)

John Burdon Sanderson Haldane, popularly known as J. B. S. Haldane, was a pioneering geneticist, evolutionary biologist, and statistician. Born on November 5, 1892, in Oxford, England, Haldane became a key figure in the development of population genetics and made foundational contributions to modern evolutionary biology. He passed away on December 1, 1964, in Bhubaneswar, India.

Haldane was educated at Eton and New College, Oxford, where he studied mathematics and classics. He later pursued a scientific career that spanned physiology, genetics, and statistics, eventually becoming a professor at University College London and later at the Indian Statistical Institute in Kolkata.

Haldane was instrumental in merging Mendelian genetics with Darwinian evolution, forming what is now known as the modern synthesis. His contributions include:

- **Mathematical Population Genetics:** Developed mathematical models to describe gene frequency changes under natural selection, mutation, and genetic drift.
- **Haldane's Rule:** Describes the patterns of sterility and inviability in hybrid offspring between species.
- **Haldane's Dilemma:** Addressed the cost of natural selection and its implications for evolutionary change.
- **Applied Genetics and Physiology:** Conducted research on human physiology under extreme conditions and made early predictions about in vitro fertilization and gene therapy.

In 1957, Haldane emigrated to India, citing political disagreements with British foreign policy. He became a naturalized Indian citizen and joined the

Indian Statistical Institute in Kolkata, where he continued his research and mentored young scientists. His later years were spent promoting science and rationalism in India.

J. B. S. Haldane is remembered as a visionary scientist who bridged disciplines and championed the use of mathematics in biology. His legacy endures through his profound impact on genetics, evolutionary theory, and scientific communication.

7. Impact and Legacy

The contributions of India's pioneering statisticians extend far beyond their individual achievements—they collectively established a robust statistical tradition that resonates through academic institutions, public administration, and global scientific inquiry. Their influence has helped shape India into a recognized leader in the field of statistics, while also contributing substantially to the global statistical community.

The establishment of the Indian Statistical Institute (ISI) by Prasanta Chandra Mahalanobis served as a foundational moment in India's scientific history. ISI not only became a hub for cutting-edge statistical research but also emerged as a vital training ground for future generations of statisticians. The institute set high standards for research and academic rigor, which have been emulated across India and in institutions worldwide.

Concurrently, the National Sample Survey Office (NSSO), initiated under Mahalanobis's guidance, institutionalized the use of large-scale statistical surveys in governance. This revolutionized how data was collected and interpreted in the Indian subcontinent. These surveys provided empirical foundations for socio-economic planning, thus bridging the gap between theoretical statistics and public policy.

Statisticians such as C.R. Rao extended the intellectual reach of Indian statistics through groundbreaking theoretical advancements, such as the Rao-Blackwell theorem and the Cramér-Rao bound. Their work has become a fundamental part of statistical inference and is taught globally in statistical education.

Contributions by Raj Chandra Bose in design theory and error-correcting codes, Samarendra Nath Roy in multivariate analysis, and J.B.S. Haldane in

population genetics, created interdisciplinary bridges between mathematics, biology, and information theory. These intersections proved instrumental in shaping domains like cryptography, genetics, and machine learning.

Collectively, their legacies are visible in curricula, journal literature, policy frameworks, and global collaborations. The international recognition they garnered through prestigious awards and academic positions underscores the global impact of their work. Most importantly, their mentorship, institutional building, and scholarly dedication have inspired countless students and professionals, ensuring the perpetuation of their ideas and methods across generations.

8. Conclusion

The legacy of India's forgotten yet foundational statisticians is not only preserved in academic texts or the walls of venerable institutions; it lives on through the continuous evolution of statistical science and its ever-expanding applications. Their pioneering efforts laid the groundwork for a culture of data-driven inquiry at a time when such a paradigm was nascent, both in India and across the world.

Their stories reveal not only intellectual brilliance but also a steadfast commitment to the social relevance of statistics. From developing multivariate techniques to crafting policies through data-informed planning, these statisticians exemplified how abstract theory can be harnessed for concrete social good.

As the world increasingly relies on data to inform decisions, from health care and economics to climate science and artificial intelligence, the relevance of their work grows ever more pronounced. Recognizing and revisiting their contributions is more than an academic exercise; it is an acknowledgment of the foundational role they played in shaping a discipline that governs much of the modern world.

Their lives and work serve as a powerful reminder that true greatness in science lies not only in discovery but also in the vision to transform that discovery into lasting impact. As we look to the future of statistics in the age of big data and AI, the principles they championed, rigor, utility, and innovation, remain the guiding light.

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CHAPTER 10

FROM ASHRAMS TO ALGORITHMS: A DESIGN-BASED RESEARCH APPROACH TO RECONSTRUCTING THE GURUKUL EXPERIENCE THROUGH VIRTUAL REALITY

Dr PIALI HALDAR

Department of Management, Brainware University, Kolkata, India
pialihaldar@gmail.com
<https://orcid.org/0000-0003-4729-6964>

DEV KUMAR MANDAL

Department of Management, Brainware University, Kolkata, India
devkumarz1997@gmail.com
<https://orcid.org/0009-0005-3740-6885>

1. Introduction

The Indian Gurukul system represents one of the oldest and most sophisticated models of holistic education in human history. Rooted in Vedic philosophy and spiritual discipline, Gurukuls emphasized not merely the accumulation of knowledge but the cultivation of character, ethics, and life skills through close mentorship and immersive living. The student (*shishya*) lived with the teacher (*guru*) in an ashram setting, engaging in discourses, rituals, physical labour, meditation, and deep inquiry. The entire learning environment was

inherently integrative, blending intellectual, emotional, moral, and spiritual development within a nature-bound and community-oriented space. While this model flourished for centuries, it gradually declined with the advent of colonial education, industrialisation, and centralised schooling systems that prioritised uniformity, examination, and textual learning over personalized and contemplative approaches.

In recent decades, education has undergone a radical digital transformation. Classrooms are increasingly mediated by screens, artificial intelligence, and cloud-based platforms. While these technologies offer scale, accessibility, and innovation, they also risk furthering fragmentation, reducing the teacher-student relationship to transactional exchanges. The current digital paradigm often excludes emotional, ethical, and experiential dimensions of learning that the Gurukul system so richly embodied. However, among emerging technologies, Virtual Reality (VR) presents a unique opportunity to bridge this gap. Unlike flat e-learning interfaces, VR can create immersive, embodied, and affective experiences that simulate presence, human connection, and ritualistic engagement, features central to the Gurukul tradition.

This research begins with a critical question: Can Virtual Reality be used to authentically recreate and reimagine the Gurukul system in a modern context? Rather than merely digitizing ancient scripts or content, the aim is to understand whether the philosophical foundations and pedagogical principles of the Gurukul, such as the *guru-shishya* bond, meditative practices, experiential tasks, and ethical inquiry, can be contextually translated into immersive virtual environments. This is not an attempt at nostalgia, but rather a futuristic exploration of how ancient Indian wisdom can inform cutting-edge educational design, especially as India moves toward implementing the National Education Policy (NEP) 2020, which emphasizes holistic, value-based, and culturally rooted learning.

To this end, the research adopts a Design-Based Research (DBR) model, ideal for linking theoretical principles with iterative, real-world innovation. Phase one of the study involves identifying core Gurukul elements through textual analysis and interviews with Gurukul educators and Vedantic scholars. Phase two translates these elements into an operational Virtual Reality Gurukul (VR-G) prototype. Phase three tests this prototype with real students using both quantitative measures (knowledge retention, problem-solving, ethical decision-making) and qualitative assessments (user engagement, presence, and

perception of the guru-student relationship).

By attempting to fuse *asrams* with *algorithms*, this research explores not just a technological possibility but a philosophical imperative: how can modern education retain soul and substance in an increasingly simulated world? In doing so, the paper contributes a rare but necessary dialogue between ancient pedagogies and modern immersive technologies, proposing a new hybrid model of education rooted in India's spiritual heritage and technological future.

2 Literature Review

2.1 Gurukul Pedagogy: Foundations, Decline, and Contemporary Echoes

The ancient *Gurukul* was more than a residential school; it was an ecosystem of integrated intellectual, moral, and spiritual formation (Biswas, 2024). Vedic and later Upanishadic texts describe the *guru–shishya* bond as a covenant in which knowledge (*vidyā*) is inseparable from *dharma* (righteous living) and *seva* (community service) (Sharma et al, 2025). Modern historians note that the core instructional modes—oral exposition, dialogic reasoning, contemplative practice, and learning through labour (*śramadāna*), mapped onto what contemporary learning science would term apprenticeship, reflection, and embodied cognition (Gopo et al., 2025).

Colonial policies and the rise of examination-centred schooling fragmented this holistic paradigm, yet recent policy shifts signal renewed interest (Harrell, 2019). India's National Education Policy 2020 explicitly calls for value-based, experiential, and culturally rooted education, invoking *Gurukul-like* ideals within a digital framework (Misra et al, 2025). Parallel grass-roots experiments, such as the Hi-Tech Gurukul initiative in Odisha and hybrid “online Gurukuls” offering Vedāntic courses via web conferencing, demonstrate attempts to blend traditional ethos with modern media. Nevertheless, most of these efforts rely on two-dimensional platforms and asynchronous videos, limiting their capacity to recreate the immersive, affective, and communal qualities that defined classical ashram life.

2.2 Virtual Reality and Design-Based Research in Education

Virtual Reality (VR) has emerged as a promising bridge between holistic pedagogy and contemporary technology, as it affords presence, embodiment, and situated action (Shihab et al., 2023). Meta-analytic evidence across 72 effect sizes shows a moderate but significant gain ($g \approx 0.48$) in practical skills when

VR supplements or replaces conventional instruction in science and engineering. Similar analyses in nursing education report small-to-medium improvements in knowledge and self-confidence, reinforcing VR's versatility across domains.

Beyond raw effect sizes, recent systematic reviews stress *how* VR should be built. A 2025 review of 63 studies identifies the immersion, pre-training, and generative activity principles as the strongest instructional drivers of learning within VR. These principles resonate with *Gurukul* practices: pre-training mirrors the recitation of foundational *mantras*, immersive context parallels the ashram's environmental immersion, and generative tasks echo hands-on *karma-yoga*.

Translating such principles into practice increasingly relies on Design-Based Research (DBR), a methodology originally articulated by Brown and Collins in 1992 that marries iterative design with theory building in authentic settings (Reinking, 2021). Contemporary DBR projects often employ VR to study motivation, presence, and learning transfer; Figueroa and Jung's 2025 multi-cycle VR-tour study in online language classes, for instance, demonstrated that iterative refinements based on learner feedback significantly amplified perceived learning value. Yet even these cutting-edge studies tend to anchor their designs in Western constructivist or multimedia-learning theories, paying scant attention to indigenous epistemologies such as Vedānta.

2.3 Research Gap

Taken together, the literature suggests three converging insights: (1) Gurukul pedagogy provides an established blueprint for holistic, ethically infused, and experiential learning; (2) VR, when guided by evidence-based design principles, can reproduce key environmental and social affordances once exclusive to physical ashrams; and (3) DBR offers the methodological scaffolding to iteratively align ancient pedagogy with modern immersive technology. What is missing is an empirical study that *explicitly embeds Vedāntic principles into a VR environment* and evaluates both cognitive and ethical outcomes through DBR cycles. The present research addresses this lacuna by prototyping and testing a Virtual-Reality Gurukul (VR-G), thereby extending VR scholarship into culturally grounded, holistic education and operationalising NEP-2020's call for technologically enabled yet tradition-rooted learning.

RQ1: Which Gurukul principles are most amenable to VR mediation?

RQ2: Does VR-G outperform conventional e-learning on retention and problem-solving?

RQ3: How do learners perceive presence, *guru*-bonding, and ethical growth in VR-G?

2.4 Research Objectives

RO1: Derive transferrable Gurukul principles for immersive design.

RO2: Develop a VR prototype embodying these principles.

RO3: Evaluate cognitive, affective, and ethical learning outcomes.

3 Theoretical Framework

This study is grounded in a hybrid theoretical framework that integrates the ICAP theory of cognitive engagement with the Vedāntic triad of learning—*śravaṇa* (listening), *manana* (reflection), and *nididhyāsana* (contemplation). ICAP, proposed by Chi and Wylie (2014), categorizes learning activities into four modes: Interactive, Constructive, Active, and Passive, with deeper engagement linked to higher cognitive outcomes. These engagement levels mirror the layered approach of Gurukul pedagogy, where learners engage actively through rituals, constructively through dialogues, and interactively with the *guru* and peers. Simultaneously, the Vedāntic learning process offers a culturally rooted lens: *śravaṇa* aligns with immersive exposure to foundational teachings (e.g., in virtual temples), *manana* involves critical reflection via scenario-based tasks, and *nididhyāsana* is facilitated through meditative virtual environments that simulate forest solitude. Together, these frameworks ensure the cognitive, affective, and spiritual dimensions of learning are addressed. The ICAP model structures learner interaction in the virtual domain, while the Vedāntic lens ensures philosophical authenticity and ethical depth. This dual-theory foundation guides the design and evaluation of the VR-Gurukul (VR-G) prototype, supporting both measurable outcomes and intangible experiential learning.

Hypotheses

H1: VR-G learners will show higher retention than control learners.

H2: VR-G learners will demonstrate superior problem-solving ability.

H3: Presence mediates the effect of VR-G on ethical-decision scores.

4 Methodology

4.1 Research Model

A four-cycle Design-Based Research (DBR) approach framed and iteratively refined the Virtual-Reality Gurukul (VR-G):

Analysis & Exploration – textual exegesis of Vedic scriptures and semi-structured interviews with ten Gurukul acharyas isolated six transferable pedagogic principles (e.g., *guru-shishya* bond, experiential tasks, contemplative practice).

Prototype Design – those principles were operationalised in a 24-scene VR-G module built in Unreal Engine 5 for Oculus Quest, comprising immersive *śravaṇa* lectures, interactive *manana* dilemmas, and meditative *nididhyāsana* environments.

Implementation – an 8-week quasi-experimental field trial compared VR-G with standard e-learning of identical content.

Evaluation & Redesign – mixed-methods assessment informed successive tweaks to interaction flow, motion comfort, and cultural fidelity.

4.2 Variables

Independent – *Learning modality*: VR-G (treatment) vs. e-learning (control).

Dependent – *Retention score* (knowledge), *Problem-solving score* (application), *Ethical-decision score* (value internalisation).

Mediating – *Presence*, measured by the Igroup Presence Questionnaire (IPQ).

Control – prior VR familiarity (yes/no), age, and gender.

4.3 Participants & Sampling

A purposive cohort of 60 Grade-10 students (mean age = 15.4 years) from two English-medium Delhi schools was recruited. Following pre-test administration, students were randomly assigned to VR-G (n = 30) or e-learning (n = 30) to minimise selection bias while preserving ecological validity.

Table 1: Data Collection Instruments

Construct	Instrument	Psychometrics
Knowledge retention	40-item MCQ test aligned to Bloom's levels	KR-20 = 0.83
Problem-solving	Scenario-based rubric (5 cases × 4 criteria)	Inter-rater $r = 0.86$
Ethical decision-making	Three values-conflict vignettes scored 0-6	Cronbach's $\alpha = 0.79$

Presence (mediator)	Igroup Presence Questionnaire (IPQ)	$\alpha = 0.88$
Qualitative insight	Observation checklist: post-study focus-group protocol	Expert-validated

4.5 Data Analysis

Descriptive statistics summarised central tendencies and dispersion for all quantitative measures.

ANCOVA (SPSS v29) compared post-test dependent variables while controlling for corresponding pre-test scores, enhancing statistical power and adjusting for baseline differences.

Mediation analysis employed Hayes' PROCESS macro (Model 4, 5,000 bootstraps) to test whether *presence* mediated modality effects on ethical-decision scores.

Thematic coding of observation logs and focus-group transcripts were conducted in NVivo 14 using an inductive–deductive schema derived from ICAP categories and Vedāntic stages. Inter-coder reliability reached Cohen's $\kappa = 0.81$, indicating substantial agreement.

4.6 Results

Quantitative Outcomes

Table 2 shows the descriptive statistics, gain scores, and ANCOVA results for the three outcome measures: retention, problem-solving, and ethical decision-making. The data reveal that the Virtual Reality (VR) group showed significantly greater improvements than the control group across all domains. In terms of retention, the VR group improved from a pre-test mean of 45.7 to a post-test mean of 82.6 (gain = 36.9), while the control group improved from 44.8 to 68.2 (gain = 23.4). The effect size for the VR group was large (Cohen's $d = 2.35$), and ANCOVA results indicated a statistically significant difference between the groups, $F(1,57) = 21.34$, $p < .001$, with a large effect size ($\eta^2 = 0.27$).

Table 3 includes a mediation analysis that examines whether presence is a mediator in the relationship between modality (e.g., VR vs. non-VR learning) and ethical decision-making. The results reveal a significant path from modality

to presence, with a standardized coefficient $\beta = 1.34$ (SE = 0.28, $t = 4.79$, 95% CI [0.79, 1.90]), indicating that participants exposed to the VR modality reported significantly higher levels of perceived presence. Additionally, path b from presence to ethics was also significant ($\beta = 1.47$, SE = 0.41, $t = 3.59$, 95% CI [0.63, 2.32]), suggesting that a greater sense of presence led to improved ethical decision-making. The total effect (c) of modality on ethical outcomes was statistically significant ($\beta = 3.01$, SE = 0.89, $t = 3.38$, 95% CI [1.22, 4.80]), while the direct effect (c') remained significant but reduced ($\beta = 1.83$, SE = 0.87, $t = 2.10$, 95% CI [0.09, 3.58]). The indirect effect (a × b) was estimated at 1.18, with a 95% confidence interval of [0.25, 2.27], not containing zero, indicating a significant mediation effect. These findings point to the effect of learning modality on ethical decision-making being partially mediated by the presence factor. In other words, VR is a more immersive learning modality, which in turn makes the learner feel more present in the scenario they are working on and thus positively affects their ethical decision-making performance.

Table 2: Descriptive Statistics, Gain Scores, and ANCOVA Results (N = 60)

Measure	Group	Pre-test Mean ± SD	Post-test Mean ± SD	Gain Δ	Cohen's d	ANCOVA F(1,57)	p	η^2
Retention (0-100)	VR-G	45.7 ± 6.3	82.6 ± 6.4	36.9	2.35	21.34	<.001	0.27
	Control	44.8 ± 7.2	68.2 ± 7.9	23.4	—	—	—	—
Problem-Solving (0-24)	VR-G	9.1 ± 2.4	18.4 ± 3.1	9.3	1.31	16.08	<.001	0.22
	Control	9.0 ± 2.6	14.0 ± 3.5	5	—	—	—	—
Ethical Decision (0-18)	VR-G	7.3 ± 2.1	15.2 ± 2.8	7.9	1.13	6.45	0.013	0.1
	Control	7.4 ± 2.2	12.9 ± 3.0	5.5	—	—	—	—

Table 3: Mediation Analysis: Presence as Mediator for Ethical Decision

Path	Coefficient (β)	SE	t / z	95% CI
a (Modality → Presence)	1.34	0.	4.	0.79 – 1.90

		28	79	
b (Presence → Ethics)	1.47	0. 41	3. 59	0.63 – 2.32
c (Total Effect)	3.01	0. 89	3. 38	1.22 – 4.80
c' (Direct Effect)	1.83	0. 87	2. 1	0.09 – 3.58
Indirect (a × b)	1.18	—	—	0.25 – 2.27

Bootstrap 5000 samples; indirect effect significant at $p < .05$.

Table 4: Thematic Frequency of Qualitative Codes (n = 60 journals + 4 focus groups)

Theme	VR-G References	Control References
Embodied Learning	46	9
Emotional Guru Bond	39	5
Mindful Reflection	34	7
Technical Frustration	6	4

Marked differences appeared in the thematic content of participant journals and focus group transcript analyses between the VR group and the Control group. Thematic analysis revealed these differences quite sharply. In the VR group, the theme of Embodied Learning appeared 46 times. In the Control group, it was referenced only 9 times. And yet, the Control group was not a group of people unfamiliar with the concept of Embodied Learning. They simply did not mention it with nearly the same frequency and in nearly the same context as the VR group.

In the same way, the motif Emotional Guru Bond, signifying the affective link with the virtual teacher or moral compass in the VR milieu, was mentioned 39 times by the VR subjects but only 5 times by the controls. This indicates that VR not only augmented the emotional salience of the learning experience but also enhanced the sense of connection with the virtual instructor. The theme of Mindful Reflection, denoting self-awareness, contemplation, and introspection triggered by the learning process, was present 34 times in the VR group and 7 times in the control group. This ratio suggests that the VR content was effective in not only imparting knowledge but also in prompting the participants to reflect more deeply on the ethical dimensions of that knowledge. The theme of Technical Frustration, meaning difficulties with navigation or glitches—was rather low for both groups. The VR group referenced this theme

6 times, and the control group referenced it 4 times. This is important because it indicates that technology did not significantly hinder the experience for either group.

In general, we find that the qualitative data mirror the quantitative findings. When analysing both forms of evidence, the picture that emerges indicates with greater confidence that VR-based learning environments directly enhance participant engagement on an emotional level, surpassing that of traditional setups. We also find that more enriched environments allow for more opportunities to reflect on the ethics of the choices one makes in virtual modelled situations than their real-world counterparts.

5. Interpretation

Knowledge Retention

The VR-G cohort outperformed the control by an adjusted mean of 14.4 points, representing a 27 % relative improvement. A large effect size ($d = 2.35$) and substantial partial eta squared (.27) confirm that immersive, scene-based instruction produced deeper encoding and retrieval compared with screen-based videos. The ANCOVA $F = 21.34$ ($p < .001$) indicates this difference remains robust after accounting for baseline knowledge, age, gender, and prior VR use.

Problem-Solving Skills

Participants engaged in the virtual ashram gained 9.3 points versus 5.0 in the control, yielding a large effect size ($d = 1.31$). The 8-week authentic tasks, such as collaboratively interpreting a virtual yajña scenario, appear to cultivate higher-order cognitive transfer. The significant ANCOVA result ($F = 16.08$, $p < .001$, $\eta^2 = .22$) corroborates the potency of ICAP's interactive-constructive modes embedded in VR scenes.

Ethical Decision-Making

Although both groups improved, VR-G's gain (7.9) superseded the control's (5.5). The ANCOVA ($F = 6.45$, $p = .013$) and moderate effect size ($d = 1.13$) suggest VR-mediated contemplative practice effectively internalised Vedāntic ethical reasoning.

Presence as Mediator

Mediation analysis shows that 38 % of VR's impact on ethical scores was

transmitted through perceived presence (indirect $\beta = 1.18$, $CI = 0.25-2.27$). Path a confirms VR modality heightened presence ($\beta = 1.34$, $t = 4.79$), while path b links presence to ethical outcomes ($\beta = 1.47$, $t = 3.59$). The residual direct effect (c) remained significant yet diminished, evidencing partial mediation. These findings empirically substantiate the theoretical claim that embodied immersion fosters moral reflection by simulating a lived spiritual context.

Qualitative Corroboration

Learner journals frequently referenced “feeling inside a sacred space” and “looking into the guru’s eyes,” aligning with the quantitative presence metric. Focus-group narratives described a “flow state” during nididhyāsana scenes, supporting ICAP’s active-constructive engagement and the Vedāntic stage of contemplative realisation. Conversely, the minimal “technical frustration” codes (6 references) indicate usability barriers were low and quickly overcome.

Gender and VR Familiarity Controls

No significant interaction emerged between modality and gender ($F = 0.84$, $p = .36$) or prior VR use ($F = 1.12$, $p = .29$), suggesting the VR-G’s benefits are broadly applicable across demographic subgroups and do not privilege tech-savvy learners.

Reliability of Measures

High internal consistency (KR-20 = 0.83; $\alpha = 0.79-0.88$) and inter-rater reliability ($r = 0.86$, $\kappa = 0.81$) affirm the robustness of the instruments and qualitative coding.

Summary of Findings

Cognitive Advantage: VR-G yields large, statistically significant gains in retention and problem-solving compared with traditional e-learning.

Ethical Internalisation: Immersive presence partially mediates ethical learning, validating the integration of spiritual context within virtual pedagogy.

Holistic Engagement: Qualitative evidence highlights embodied, emotional, and reflective dimensions, echoing Gurukul tenets, rarely achieved in screen-based formats.

Collectively, these results demonstrate that re-imagining the Gurukul system

through VR is not merely technologically feasible but pedagogically superior, offering a compelling path toward culturally grounded, value-oriented digital education.

6. Discussion

The findings of this study validate the central hypothesis that the ancient Gurukul pedagogy can be meaningfully reimagined and operationalised through Virtual Reality (VR). The significantly higher gains in retention, problem-solving, and ethical decision-making among the VR-G group underscore the transformative potential of immersive learning environments grounded in cultural and philosophical authenticity.

The integration of Vedāntic principles with ICAP-based engagement in the VR-G design created a multidimensional learning experience. Learners were not passive recipients of information but active participants in a simulated Gurukul environment that enabled experiential and contemplative practices. The high effect sizes across outcomes reinforce that when digital instruction is rooted in deep cultural epistemologies, it can achieve both cognitive and ethical learning objectives. The partial mediation of presence in ethical outcomes confirms VR's capacity to create a sense of 'being there,' enabling learners to internalize values more effectively than through conventional screen-based e-learning.

These outcomes also align with prior research showing the efficacy of VR in increasing engagement and learning transfer, but the novelty here lies in embedding indigenous pedagogies, specifically Vedānta, into instructional design. Unlike typical VR studies that focus on Western cognitive frameworks, this study offers a hybrid model combining spiritual depth with instructional technology.

The qualitative themes further affirm that students experienced emotional connection, mindful immersion, and reflective insight, hallmarks of the traditional Gurukul experience. This supports the argument that immersive environments can replicate not only the physical aspects of learning spaces but also their affective and philosophical dimensions.

In summary, the discussion supports the proposition that VR, when designed with fidelity to traditional Indian pedagogies, can bridge the gap between ancient wisdom and future-ready education. It opens new avenues for culturally responsive EdTech development, aligning with India's National

Education Policy (NEP) 2020 and global calls for ethical, holistic learning.

7. Implications

The outcomes of this study offer significant implications across theoretical, practical, and policy dimensions, especially in the context of reimagining education in India and beyond.

7.1 Theoretical Implications

This research extends the boundaries of educational theory by merging ICAP's engagement model with Vedāntic learning stages (*śravaṇa*, *manana*, *nididhyāsana*). The hybrid framework offers a novel lens to study immersive learning, not just as a tool for knowledge acquisition, but as a medium for ethical formation and spiritual insight. It suggests that presence, when culturally embedded, can act as a mediator of moral cognition, adding depth to constructivist and experiential learning models.

7.2 Practical Implications

For educators and instructional designers, the study provides a replicable blueprint for designing immersive learning environments rooted in indigenous values. The VR-Gurukul prototype demonstrates that ancient Indian pedagogy can be digitized without dilution. Teachers can adopt similar VR models to teach history, philosophy, language, and ethics using local cultural narratives. Moreover, this model opens new avenues for value-based education in secular, private, and public institutions, fostering empathy, discipline, and reflection alongside academic achievement.

7.3 Policy Implications

Aligned with India's National Education Policy (NEP) 2020, this research supports the integration of technology with tradition. Policymakers may consider investing in VR labs that go beyond STEM, incorporating immersive modules rooted in Indian knowledge systems. Government-funded initiatives could adopt this model to promote cultural pride, ethical reasoning, and critical thinking from an early age.

In essence, the study bridges spiritual heritage with digital innovation, showing how culturally responsive educational technology can produce both academic excellence and moral growth, thereby shaping future citizens equipped with intellect, empathy, and identity.

8. Limitations

While the study demonstrates promising outcomes, several limitations must be acknowledged that constrain the generalisability and scope of the findings.

First, the sample size was limited to 60 students from two urban English-medium schools in Delhi. This restricts the applicability of results to broader demographic groups, particularly rural learners or those in regional-language schools. Future studies should incorporate more diverse socio-economic and linguistic backgrounds to improve external validity.

Second, the intervention duration was eight weeks, which, while sufficient for short-term outcome measurement, may not capture the long-term impact of immersive Gurukul-based learning, particularly on sustained ethical behaviour and value internalisation. Longitudinal studies are needed to assess retention and character development over time.

Third, the VR-G prototype focused only on core Vedāntic elements and excluded other Indian philosophical traditions such as Nyāya, Sāṃkhya, or Buddhism, which also contributed to India's educational heritage. The design could be enriched with pluralistic representations.

Fourth, the technical familiarity of students with VR was not uniform despite pre-trial orientation. Although no statistical bias was found, subtle variations in comfort levels may have affected engagement and outcomes.

Lastly, cost and accessibility of VR infrastructure remain practical constraints for large-scale deployment in under-resourced schools, warranting further policy and design innovations.

9. Conclusion & Future Work

This study set out to explore whether the ancient Indian Gurukul system—rooted in Vedāntic philosophy—can be meaningfully reimagined through immersive Virtual Reality (VR) technology. The findings affirm that VR-Gurukul (VR-G) not only improves academic outcomes such as retention and problem-solving but also fosters deeper ethical reasoning, emotional engagement, and spiritual reflection. Through a carefully crafted Design-Based Research (DBR) methodology, the study successfully integrated cultural

authenticity with modern pedagogy, offering a replicable model of value-based immersive education aligned with NEP 2020.

The results suggest that technological innovation need not be culturally agnostic. On the contrary, when local epistemologies such as *śravaṇa*, *manana*, and *nīdīdhyāsana* are embedded into VR learning design, they can enhance both cognitive and moral development. The mediation effect of ‘presence’ underlines the unique capacity of immersive technologies to replicate the affective and experiential depth once exclusive to physical Gurukul settings.

However, the study also recognises limitations in scale, access, and inclusivity. Future research should expand the participant base to rural, regional-language, and lower-income learners, ensuring equity in EdTech innovation. Further, longitudinal studies are needed to assess whether immersive Vedāntic learning has lasting impacts on character formation and ethical behavior.

In terms of technology, future iterations of VR-G can incorporate AI-driven adaptive feedback, multi-language voiceovers, and augmented reality (AR) extensions for hybrid classrooms. Additionally, integrating diverse Indian knowledge systems—such as Ayurveda, Nyāya, or Yoga philosophy—can make the model more holistic and inclusive.

In conclusion, *From Ashrams to Algorithms* is not just a thematic metaphor—it is a practical blueprint for the future of culturally grounded digital education. By harmonising India’s philosophical wisdom with emerging immersive technologies, we can shape learners who are not only intellectually capable but ethically and spiritually awakened.

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CHAPTER – 11

FROM VEDIC STARS TO AI SYSTEMS: A DESIGN SCIENCE AND MIXED-METHODS INQUIRY

DEV KUMAR MANDAL

Assistant Professor, Brainware University, Kolkata, India
devkumarz1997@gmail.com

RUPAM DHANI

Assistant Professor, Brainware University, Kolkata, India
rupamdhani@gmail.com

1. Introduction

Astronomy has played a significant role in urbanization, timekeeping, navigation, and exploration of the universe. The study originated in Jyotisha, or one of the six Vedangas of the Vedic culture, which dates back more than two thousand years on the Indian Subcontinent (Singh & MBPG College Dadri, 2020). In comparison, Western astronomy developed comparatively in a more or less independent relation to cultural, spiritual, and mathematical contexts. Although the advanced theories of planetary movement, lunar analysis, and calendar computation had already been defined in the Surya Siddhanta, Aryabhataiya, and Brahmasphutasiddhanta centuries earlier, even before telescopic observation became common during the 17th century, these theories

now only have peripheral usage in modern fields of computation simulation, learning, or forecasting (Sen, 1987). There is, therefore, an urgent necessity to re-read and rewrite this huge literature in a digital form.

At the same time, the advancements in Artificial Intelligence (AI) are transforming the sphere of current scientific work in various areas, such as medicine, finance, and space exploration (Xu et al., 2021). The use of AI in astronomy ensures the analysis of massive amounts of data produced by radio-telescopes, categorization of galaxies, and predictions of astronomical events (Zhang et al., 2023). Such a computational revolution is, however, largely based on Western science models to the disregard of the non-Western models of cosmology, and in such a manner the question of how AI can be further used to bridge the gap between old and new approaches, specifically where the Indian setting manages to be the case.

The given chapter introduces the idea of a hybrid system in which Vedic astronomical traditions and the virtual prototype based on AI are combined. At the core of this will be the premise of a mixed-methods design with a guiding research direction that will be a Design Science Research one to achieve two objectives, the first being to re-engineer the planetary configurations, Nakshatra systems and moon cycles found in ancient scriptures and the second will be to verify the authenticity and cultural applicability of the said alignments and systems by subjecting them to both qualitative analysis as conducted by Sanskrit scholars and quantitative analysis in the computational astronomy realm. The final thing is a virtual AI program that incorporates some of the elements of ancient Indian astronomy.

Design Science Research (DSR) makes an adequate methodological approach to the current research, because DSR is focused on solving real-world problems by systematically constructing innovative artifacts (Hevner et al., 2018). In the given case, the artifact can be described as a virtual simulation tool simulating astronomical phenomena with the help of rules and Vedic-derived data. The requirements of such a system are closely matched with the DSR iterative process that includes identifying the problem, defining objectives, creating an artifact, evaluating, and communicating. The mixed-methods approach that incorporates both a qualitative (interviewing of experts and text-related analysis) and quantitative (based on the model performance indicators) data will help to comprehend both the cultural and the technical aspects in a comprehensive way.

India forms a very pertinent setting for the planned project, with the combination of its traditional astronomical outlook, on the one hand, with its present vibrancy of artificial intelligence, on the other. Efforts like Digital India, NEP 2020, and Atmanirbhar Bharat represent a new resolve to take a fresh thrust in revitalizing indigenous knowledge systems by inculcating digitalization into them. In the context of this wider world, the use of classical methods of astronomy hybridized with virtual simulations augmented by artificial intelligence is not just a technical undertaking, but is a continuation of earlier attempts to hand down cultural heritage, improve educational practice, and increasingly firm scientific knowledge. Every such system that touches on modern-day computational paradigm gives, at the same time, a cultural perspective of Indian identity and considers the scientific demands of the present age (Moreno Sandoval & University of California, Los Angeles, Graduate School of Education and Information Studies, 2013). The potential overlap of historical revivalism and inclusive education, cultural informatics, and indigenous AI also prolongs the relevance of this piece. The visualization of Vedic cosmology can be found in systems aimed at students, researchers, and other enthusiasts that would allow them an easier and more intuitive means of digesting this material and discussing the material in more subjective and predictable ways (Roy, 2025). This kind of integration goes beyond a narrow type of historical revivalism; rather, it creates a channel of integrating the rest of the traditional knowledge systems into the technological solutions in many spheres, including medicine, agriculture, and environmental science (HeinOnline, 2025).

In conclusion, the current work amounts to a first attempt at building and critically analysing some computational models of Vedic astronomy using state-of-the-art methods in AI. It does so in a research program that has no explicit prioritization, not just between innovation and tradition, but into the epistemological wealth of Indian astronomers as well as computational capabilities of AI, and poses the more general question of the intellectual contours of digitally culturally-situated science (Sumanarathna, 2018b).

2. Literature Review

The integration between Artificial Intelligence (AI) and the traditional forms of Indian astronomies will require a synthetic literature survey based on four interdependent areas that include: (1) the ancient Indian astronomy, (2) the current uses of AI in astronomies, (3) the Design Science Research (DSR)

framework as the methodological background, and (4) mixed-methods research expressed in the context of cultural knowledge systems. This kind of review forms a composite conceptual and methodological framework for the current investigation.

2.1 Traditional Indian Astronomy: A Legacy of Precision and Philosophy

Traditionally known as Jyotisha, ancient Indian astronomy is one of the most developed and oldest corpora of celestial wisdom in the world (Plamadjala, 2010). The discipline was originally formalized inside the Vedangas, a collection of secondary disciplines to be added on to the Vedas (Kak & Oklahoma State University, Stillwater, 2011). The field served the role of calendar management and rituals. With further sophistication, it became an advanced timekeeping system, astronomical observatory, and eclipse prediction system, and astrological model (Sigismondi & De Vincenzi, 2024).

One of the most fundamental works is considered to be Surya Siddhanta, which is dated around 400 CE (Mandal, 2020). It defines movements of the sun, moon, and planets and provides the computational procedures, with significant precision, which specify their positions (Sozzetti, 2005). Other Hindu works, including Aryabhata (499 CE), Aryabhataiya, Brahmagupta (628 CE), Brahmasphutasiddhanta, and Varahamihira (628 CE), Panchasiddhantika, appear to be extremely influential in the development of Indian astronomical and mathematical models (Chatterjee, 2015). Characteristic Vedic astronomy: The Vedic astronomy integrated cyclical time as articulated in the doctrine of Yugas, sidereal time based on the Nakshatras, and the use of imagery, especially the Grahas and Rashis (Sodeke, n.d.). Contrastingly to the concept of heliocentrism that western astronomy has embraced, the traditional Indian models are more geocentric but highly mathematical (Lomas & Case, 2023); they make use of sine tables, interpolation, and improvements to diurnal motions. Other scholars, such as David Pingree (1970) and K.V. Sarma (1985), have highlighted the sophistication in computation that the systems hold.

These ancient systems, despite their historical significance, are relatively unexplored in areas of computation, this in part due to the complexity of the Sanskrit notations of mathematics and symbolic logic (Kadvany, 2016). Current projects aim at the digitization of ephemeris information and the modeling of the planetary positions, but those attempts rarely use indigenous knowledge systems or Vedic logical constructs (Gupta & International Science Congress

Association, 2015). There remains, therefore, a dire necessity of the digital recontextualization of Vedic astronomy with regard to the modern computational paradigm.

2.2 Artificial Intelligence in Contemporary Astronomy

The development of high-resolution telescopes and space-based devices has made the delivery of ever-increasing amounts of observational data in modern astronomy, beyond the processing capability of human operators to analyze or examine serially (Faaique, 2023). To solve this problem, a set of AI methods, especially the neural networks, cluster methods, Bayesian method, and reinforcement learning, have been actively used to categorize space objects, predict space phenomena, and analyze image feeds of the radio and optical observatories (Massimi et al., 2022; Camporeale, 2019).

Machine learning models have played an important role in many use cases:

- Detection of exoplanets with archival data of Kepler and TESS missions;
- Deep-learning based automatic galaxy classification;
- Prediction of solar flares and cosmic rays;
- Anomaly finding in pulsar timing arrays.

The flexibility and the pattern-finding ability of AI would be especially applicable in the emerging field of astro-informatics, a multidisciplinary approach that integrates informatics and machine-learning methods with astronomical data (Chinthamu & Karukuri, 2023). Still, existing uses of AI in astronomical studies are overwhelmingly Eastern scientific ideologies-driven, with an indifferent focus on conventional astronomical models or divergent cosmologies.

The process of decolonizing astronomy hence becomes one global discussion that focuses on the inclusion of the indigenous knowledge system (Murove, 2018). The demand has arisen, as shown through scholarly work, to include the provision of culturally sensitive astronomy curricula and the modelling methodologies (Salimpour & Fitzgerald, 2022). However, in spite of India having a rich history of computational astronomy, the possibilities of the application of AI in Jyotisha and the field of the Panchanga are hardly researched (Sule et al., 2025).

2.3 Design Science Research (DSR): A Methodological Fit for Cultural-AI Integration

The Design Science Research (DSR) paradigm is a rather solid approach in

information systems research, which is especially applicable to projects concerned with the implementation of innovative artifacts that are rooted in real-life applicability (Jat et al., 2024). Research outlines a total of six fundamental phases they are (1) identification of the problem, (2) definition of objective, (3) design and development, (4) demonstration, (5) evaluation, and (6) communication (R. K. Baker, n.d.). Notably, the approach is recursive and circulatory, which stimulates the constant sharpness by checking and evaluating comments.

It has become more popular in areas like education, cultural informatics, and the digitization of heritage and in those spheres, there is a need to balance technology and sensitivity to context (Poulopoulos & Wallace, 2022; Lian & Xie, 2024). One of the examples is the merger between Vedic astronomy and artificial intelligence (AI) that raises a challenge that requires reaching both technological and sound cultural, linguistic, and epistemological knowledge (Mishra et al., 2024).

Artefact-centred focus of DSR is a fitting direction in projects with the virtual Jyotisha simulator or AI that can be utilized to work out the Vedic calendar. Likewise, the framework also encourages interdisciplinary cooperation in a natural fashion, which is a requirement as we bring together Sanskrit scholarship and computational astronomy with artificial intelligence (Aithal & Aithal, 2019).

2.4 Mixed-Methods Research in Cultural and Computational Contexts

The appropriate research methodology used in the design science research (DSR) displays the direction in which the artifacts are designed and formed, and a mixed methods inquiry reinforces this process by coordinated use of both the qualitative and quantitative methods, thus advancing the dual levels of knowledge (Huseynli et al., 2022; De Castro et al., 2025). The integrative design is especially useful in cases where the research agenda lies within the combination of technical appraisal and socio-cultural inquiry (Ravasi & Stigliani, 2012). According to a study, one of the salient features of mixed methods design is the ability to triangulate evidence and strengthen validity as well as merge different points of view (Perez, n.d.).

The present study is a case of qualitative activities, which are essential in the process of interpreting ancient Sanskrit books into computable logic and rules

in the form of semi-structured interviews, scriptural content analysis, and expert validation. The interpretations form the basis in the design of AI algorithms used to emulate astronomical behaviour.

At the same time, the accuracy testing, root mean square error (RMSE), and performance benchmarking quantitative approaches allow assessing how effectively models are combined with the current astronomical data, especially that according to NASA and ISRO (Peng & Bai, 2019; Dinesh et al., 2024). Previous studies record the usefulness of mixed methods in digitizing the traditional knowledge systems. Examples of the two-tiered approach, whose success is provable, are the studies of computational modelling of the science of Ayurvedic health care and modelling ancient techniques of agricultural life (Payyappallimana & Venkatasubramanian, 2016). Therefore, the study of Vedic astronomy and its combination with modern AI is quite unexplored, which is an additional indication of the original character of the research.

3. Research Objectives

- To digitize key elements of Vedic astronomy for computational modeling.
- To develop an AI-based virtual system simulating Vedic celestial mechanics.
- To evaluate the system using the Design Science Research (DSR) framework.
- To validate the system's cultural and scientific relevance using a mixed-methods approach.

4. Research Methodology

The proposed research study takes a hybrid approach to research as it will employ the Design Science Research (DSR) model with the Mixed-Methods approach. Such a mixed disposition makes it possible to work on the construction of a computational artifact and to probe into the cultural and philosophical milieu of Indian traditional astronomy at one and the same time.

The DSR framework comprises the process of building the computational artifact. The six stages, which are problem identification, objective definition, design and development, demonstration, evaluation, and communication, have been done sequentially. The absence of computational models in the representation of Vedic astronomical concepts was itself termed as a problem. Based on this, it was the aim of the project to develop a simulation program that could draw and compute Nakshatra, Tithis, planets, and lunar phases, as in the traditional documents of Sanskrit literature. To achieve this goal,

mathematical formulas that have been derived from texts like the Surya Siddhanta were converted into algorithmic forms and embedded in an AI system called a rule-based logic and supervised learning algorithms-based system. The system has then been applied to modern astronomical data sets to check compatibility with modern ephemeris systems.

A Mixed-Methods approach was deployed to facilitate the development of depth and contextual accuracy. The qualitative aspect included ten interviews of professionals who had expertise in Sanskrit, astronomy, and the history of cultures. These interviews substantiated the researcher's astrological reasoning by the researcher. The quantitative aspect involved the measurement of the predictive ability of the system in terms of Root Mean Square Error (RMSE), calculation of the percentage values of the accuracy, and benchmarking between the datasets provided by NASA and ISRO. These strands of methodology enabled the creation of a clear picture by integrating these streams under the heading of technical soundness into cultural appropriateness and epistemological authenticity. A guarantee of reliability was provided through the repetition of the implementation of the system on numerous real-world datasets and iterative validation procedures. This was through consistent replication in terms of output code-level testing and during modular design. Expert multiple-loop feedback also enhanced procedural integrity. The construct and content validity were dealt with using the parameters in the AI model and aligning them with real mathematical translations of Vedic writing and triangulation of qualitative information in a range of scholarly backgrounds.

Together, this methodological design allows achieving a balance between the innovation aspect of computation and the authenticity of cultural expression. It proves that it is possible to integrate general knowledge of the Indian astronomical tradition into AI systems, hence promoting further goals of digital heritage preservation and culture-oriented technological development.

5. Data Analysis and Findings

As discussed in this investigation, the study critically considers two panels conjoined in one another: (1) a quantitative assessment of the accuracy of astronomical predictions produced by an AI-driven virtual astronomy platform introduced recently, and (2) a reflection of cultural and epistemological vectors resolved by expert interviews performed as part of the preliminary research. Analytic framework, as such, thus inherits a twin purpose: stringent assessment of the computational capability of the system as well as incisive caution in the

way one regards the explanatory force that arose as a creative response to the Vedic sources which have been used to build its knowledge space.

5.1 Quantitative Analysis: Model Performance Evaluation

In the context of the current study, an artificial intelligence (AI) artifact was conditioned to simulate planetary configurations, aspects of the lunar phase and position of the nakshatras (Vedic divisions of the stars) using rule-based logic derived out of traditionally canonical texts such as the Surya Siddhanta, the Aryabhata and cross-checked Vedic calendar information in the Panchanga. The simulation was measured on scenarios depicted in data published by NASA and ISRO as standards of plan-terrestrial and Lunar peak accuracy in the phenomenon of positioning. An AI algorithm to be attached was designed on the basis of the Python libraries, in particular, Skyfield, Astropy, and TensorFlow.

Performance Metrics Table

Observation Category	Benchmark Dataset	AI Model Output	Absolute Error (°)	Accuracy (%)	RMSE
Lunar Phase Prediction	ISRO Ephemeris	Match in 28/30 days	~0.2	93.3%	0.187
Nakshatra Position Matching	Panchanga + NASA	360° match in 348/360 positions	~0.5	96.7%	0.274
Solar Transit Accuracy	NASA Horizons	Match in 364/365 days	~0.1	99.7%	0.092
Planetary Longitudes (Mars)	JPL Data vs AI Model	Deviation $\leq 0.6^\circ$		92.8%	0.316
Tithi Alignment (Lunar Day)	Panchanga Cross-check	Match in 88/92 days	~0.25	95.6%	0.209

Interpretation of Quantitative Findings

A system based on AI has been studied to determine its ability to recreate classical Indian astronomical constructions in comparison and analysis with

modern datasets. It was found that based on lunar phase prediction, there was 93.3 % agreement with the modern observations, proving that the ancient models of the movement of the moon, as perceived mathematically, were calculable. The aptness of procedure was 96.7 per cent when mapping the Nakshatra system, which is based upon dividing the celestial ecliptic of 360 into 27 equal divisions, and hence there was a great convergence of the model with the sidereal star data. The solar transit forecasts, which play a prominent role in the identification of festivals and seasonal transitions in the Indian tradition, have had the greatest accuracy of 99.7 percent, and out of a year, there is only one day of discrepancy. Such a discovery confirms the mathematical soundness of Vedic solar computations. When applied to the planetary longitude test (e.g. Mars), the AI model resulted in 92.8 % correlation, demonstrating the possibility of incorporating the ancient parameters to integrate the planetary motion into the virtual simulations.

Tithi alignment test, which is of use in the day-to-day Panchanga generation, showed 95.6% correctness. This finding implies that the Vedic way of calculating lunar days, an angular difference between the Sun and the Moon, can be successfully transferred to AI logical graphs with minimal alteration. The Root Mean Square Error (RMSE) was constant and better than 0.35 in all parameters, which is acceptable not only under ancient and modern observational error limits. The results confirm that the artifact performs according to the requirements of astronomical computation and, accordingly, that it proves the possibility of induction of traditional Indian astronomy patterns into virtual systems of AI.

5.2 Qualitative Analysis: Thematic Insights from Expert Interviews

To achieve epistemic and cultural authenticity, four domain experts (ten people in total; four Sanskritists, three working scientist-astronomers, and three cultural historians) were recruited to approve the translation and interpretation of Sanskrit astronomical formulas and concepts into computable logic. This cohort was interviewed in a semi-structured way to ensure the correctness of the transcriptions and analytic schemes.

Some emergent themes are:

1. Epistemic Fidelity: Specialists emphasized the need to reflect on the cyclical representation of time inherent in Indian cosmology (i.e., YugaKalpa cycles) as opposed to the largely linear sequential topology of Western coevals.

2. Symbolic Logic Translation: It was observed by scholars that metaphorically rich Sanskrit verses are challenging to translate into the structure of algorithms, especially in instances where there is a harmonization of poetic and theological symbols, with empirical observation.

3. Cultural Significance: Historians stressed that the computing model must also display the ritual, agricultural, and calendrical importance behind the astronomical phenomena besides simply simulating them to support the socio-cultural role of Jyotisha.

4. Ethical AI Representation: Several scholars have warned against reductionism and promoted the multilayered approach that allows a user to see symbolic, mathematical, and visual information simultaneously.

Interpretation of Qualitative Findings

Qualitative discussion confirms that AI-translation of Vedic astronomy cannot be reduced to computational implementation, but, on the contrary, is a multidimensional translation of cultures with a sense of depth and background. The logic behind Sanskrit verses tends to be interwoven with both metaphorical and philosophical meaning and thus requires a professional decoder even before formal modeling can be achieved. This interpretive engagement was used to enhance what can be defined when individuals engage in Interpretive involvement, it can be said to contribute towards the refinement of the AI framework and subsequently guarantee both cultural authenticity and functional involvement.

Theorists also expressed their views on the educational worth of interactive visualisation instruments, e.g., schematics of planetary motions, Nakshatra chronologies, calendars of rituals, etc, to enable participation and cognition. The following recommendations have been taken into consideration when formulating the final design of this system, which has produced a multi-layer simulation.

To conclude, the alignment of the quantitative performance measures with the qualitative validation denotes an invigorated fusion of the archaic Indian astronomic theory and modern practices in AI. The system is extremely recursive in its logic of Vedic astronomy and is endorsed by scholars in its cultural validation. The effectiveness of this twofold analytic evaluation contributes to the relevance of AI beyond its usefulness as a scientific tool into an instrument leading towards sustaining and bringing forth a new walk of life

of indigenous knowledge systems through digital times.

6. Discussion and Implications

This study provides strong speculations of the incorporation of the Vedic astronomical technology to modern AI-based virtual technologies. Findings point to the fact that using traditional Indian models under the conditions of strict interpretation and algorithmic translation, we can match them with modern astronomical data at the same time providing an epistemological outlook divergent from the prevailing Western scientific tradition.

Technically, the results of high accuracy and low root-mean-square error (RMSE) in the various simulations of the lunar, solar, and planetary motions uphold the computational robustness of classical approaches to Indian science and thus serve to support the proven mathematical fidelity extant in other works such as the *Surya Siddhanta* and the *Aryabhatiya*. Further, AI trained on the organized translations of such models shows high performance, indicating that there is untapped potential in using AI in ritualistic calendars, astrological software, and educational systems.

Traditional culture, with the help of the experts' interviews, is also used to explain the deeper meaning of Jyotisha not only in its astronomical system but equally in the cosmic system, which embraces the temporal order, ritual practices, environmental thoughts, and social life. This wider sense of orientation is often hidden in technical renderings. The AI artifact conceived in the course of this work thus obtains a new level of importance through integrating the symbolic and philosophical layers of the user interface and functionality into its main design such that the outcome digital system is not only the computationally efficient one, but rather the ethnographically aware and contextually pertinent one.

The study has far-reaching implications. First, it creates a new direction in the culturally informed AI development, where the indigenous knowledge systems are not excluded but serve as the input in the design of algorithms. Second, it constitutes a model of conservation of the digital heritage, especially conservation of non-textual mathematically encoded knowledge as in the case of astronomy. Thirdly, it presents pedagogical aids according to the goal of achieving the National Education Policy (NEP) 2020 of assimilating the traditional systems of knowledge within Indian territory into contemporary education.

On a strategic level, the project fulfills the goals of AI and Digital India initiatives, both of which rely on the fact that innovation can be based on the civilizational resources of the country, providing globally significant, but locally contextual, technological innovations. In such a way, the research preconditions future interdisciplinary works in the sphere of astroinformatics, the digital humanities, and computational Indology.

7. Limitations and Future Research

The current research is an experiment of a new, interdisciplinary solution, in which traditional Indian astronomy is intersected with artificial intelligence, but there are a number of limitations that will have to be recognized.

The interpretation of Sanskrit texts is in itself a difficult thing. The various verses in the Surya Siddhanta, the Aryabhatiya, and such are figurative, poetic or situational, and demand fine translation and contextual interpretation. Despite the intention to be validated by the scholars of Sanskrit, there might still be the lingering interpretive bias of the computational translation, including in the standardization of metaphysical language into logical algorithmic principles.

Second, the AI model could only use some astronomical parameters, specifically consisting of lunar phases, Nakshatra positions, and planetary longitudes. Other aspects of Vedic cosmology, including retrograde (Vakra) and eclipse (Grahanas) computation, or the intricate Yuga system, were rejected due to time constraints, and in some cases lack of available data. Such a limitation restricts the completeness of the system and the possibility of entirely mimicking the Jyotisha system.

Third, the adequacy of sample size in terms of qualitative validation seemed to be small (N=10). In such a way, the cross-cultural interpretation may be impeded. A wider view of stakeholders, including regional traditions, temples, astrologers, and Panchanga writers, might provide more satisfying, complex insights into the modern-day practice of Vedic astronomy.

In terms of the technical scope of the artifact, it is meant to be a learner-supervised and rule-based system. Future versions might work on unsupervised and reinforcement learning tools to discover deeper patterns or emulate celestial behaviors that are still awaiting in future maps in current databases.

The present research can be developed in the future with immersive visualizations with AR/VR, a multilingual interface, and interaction with interactive educational modules to use in the classroom. It also leaves room to apply the approach to other indigenous knowledge traditions: Ayurveda, Vastu, or Indian logic in the framework of AI design science. These orientations will further improve the confluence between cultural authenticity and technological development.

8. Conclusion

In the current chapter, a new exploration that purposefully swings between ancient Indian astronomy and modern artificial intelligence will be presented by following a Design Science and Mixed-Methods approach. By the literal translation of complex Vedic astronomical constructs into computer-based simulators, the paper validates not only the scientific validity of such models that are inherited but also testifies to their further suitability in the digital age.

Investigation result: The virtual application that could calculate the lunar phases, Nakshatra, and planets' longitudinal positions displayed a high accuracy level and RMSE values lower in comparison to modern astronomical data. This fact establishes the feasibility of the computation of knowledge recorded in books like Surya Siddhanta and Aryabhatiya. Further qualitative discussion with the scholars and experts ensured that the translations and application strictly followed the philosophical and symbolic structure of Jyotisha.

Notably, the exploration is not limited to a technical implementation; it upholds the paradigm of culturally grounded artificial intelligence whereby indigenous knowledge is not only preserved, but they are translated into creation technology. Through this it is backing India in its larger ambitions to become digitally self-sufficient and to transform education and provide a practical example of how tradition can support future-focused learning and growth.

The implications of the synthesis of AI in traditional astronomy are quite pregnant with the future of work in astroinformatics and heritage digitization, curriculum-making, immersive learning, and cross-disciplinary studies. Therefore, the current project is a template of additional academic endeavors where science, culture, and technology join forces to create all-inclusive, context-aware digital systems. Finally, it once again proves the statement

according to which the path between the Vedic celestial observation and modern AI is not just possible, it is very significant.

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CHAPTER – 12

DECODING THE INDIAN SCHOOL OF THOUGHT: EMBRACING AND INTEGRATING THE INDIAN KNOWLEDGE SYSTEM INTO THE STUDY OF COMPARATIVE RELIGIONS: THE J & K APPROACH

ISHAAN ARORA
Independent Researcher

1.An Overview

The Indian subcontinent entails as well as encompasses a wonderful history that celebrates multiple customs interwoven amidst various traditions as well as religions amassing the warmth of interfaith relationships. It has been an epicenter of a plethora of wisdom and intellectuality. One of the major strengths that is evidently felt in the Indian traditions is that they were never static or outdated rather they were and are dynamic, having the potential of getting continuously and constantly evolved with the pace of changes and reforms taking place in our surroundings thereby surmounting their importance as far as the contemporary society is concerned.

To highlight in reference to the above aforementioned statement are the

theories and works of one of the renowned economists as well as administrators of his time i.e. Kautilya who is additionally referred to as Vishnu Gupta or Chanakya. Kautilya was the guru of Chandragupta Maurya and the statement here implies that whatever knowledge and wisdom the ruler amassed is credited to Kautilya. Kautilya was an all rounder; a master of every field be it diplomacy, economics, international relations, public administration and so on. Kautilya has contributed to all these spheres immensely by way of propounding several theories which were not just relevant then but holds immense significance and relevance in the contemporary globalized society. For instance: Kautilya's Mandala Theory, a renowned theory that deals with the sphere of international relations and it states that "Our Enemy's Enemy is our Friend". This theory was a path breaking contribution as far as the domain of international relations is concerned and this theory holds immense importance even today as many nations across the globe have been following as well as imbibing the crux of this popular saying so as to build and manage their relationship with the nations across the globe. In addition to this, who can forget the famous Saptanga Theory i.e. the Seven Elements Model where in he laid down the seven prominent pillars on whom rests the entire fundamentals of administration. Here he mentioned about the ruler, the praja (people), koshha (treasury), danda, army, durga (Fort) etc. which serves as the focal point of every administrative set up and without paying due allegiance to which it won't be possible for any administrative setup to survive successfully. This theory entails as to what are the responsibilities that a person as a king or savior of the nation need to conform to so as to ensure that he amasses a significant place amidst the hearts of the people or praja. On similar lines the responsibilities and functions of each and every element has been illustrated in detail in his magnum opus "Arthashastra" which is an ancient treatise on economics and public administration. Besides Kautilya, there are several other thinkers whose works and contributions have laid down the basis for the discoveries and innovations being brought up in the contemporary society. For instance the idea of surgery was initiated by Sushruta, grammar by Panini, and the lists is endless. All these contributions have been grouped together and assigned a categorical term called the Indian Knowledge System or the Traditional Knowledge System.

The term Indian Knowledge System is a wider term which entails and encompasses a spectrum of domains be it philosophy, art, science, ethics or spirituality. It is owing to the crucial as well as pivotal space that the Traditional Knowledge System amasses in the global society that the pioneer apex level education body in India i.e. the University Grants Commission (UGC) has

come up with an official notice for incorporating the Indian Knowledge System into the well-established curriculum of the various universities and colleges pan India. This notice has been issued with the intention of propagating the essentials of the Indian Knowledge System amongst the PG students and offer them an opportunity to delve deeper into understanding and discovering the true realms of the Intellectual Heritage that India is home to. The crucial role that Indian Knowledge System plays in reforming the contemporary trends in the Indian education system can be very well understood and decoded by the fact that this school has found a due mention and inculcation in the New Education Policy 2020. In lieu of the New Education Policy 2020, several centers have been constituted specifically dedicated to this domain so that path breaking research and curriculum development can be efficaciously undertaken. The centers have been vested with the responsibility to integrate the Indian Knowledge System with STEAM (Science, Technology, Engineering, Arts, and Mathematics) in all possible and probable ways so that students are offered with plethora of opportunities to decode and unfurl the mainstream subjects with the aid of the new horizons that the Indian Knowledge System offers.

2.Embracing the Traditional Knowledge System: The J & K Approach

It is not denying the fact that the contemporary union territory of Jammu and Kashmir has been an epicenter of knowledge, wisdom and hermitage since the very beginning of the “Bhaskar161 dharmā”. There is a whole list of sages available at our disposal whose inception can be traced as well as tracked from this beautiful heaven on Earth i.e. Jammu and Kashmir. On the similar lines, the contemporary union territory of Jammu and Kashmir occupies a crucial and pivotal place amidst all those regions which have been instrumental in shaping as well as laying down the foundations of the Traditional Knowledge System. To state some more points on this domain, it is worth mentioning that at the heart of the Traditional Knowledge System lies Purva Paksha i.e. its regard for plurality. The term “Plurality” here implies that Indian Knowledge System offers a moral learning as well as obligation to respect and pay due heed to the opponent’s views and opinions. This has been the very basis of the learnings we all have acquired in our childhood from our mentors and family and this is also a trait which the contemporary management tycoons also assign prime importance to as far as undertaking the recruitment for big leadership roles and allied responsibilities are concerned. This trait is considered one of the prime factors around which is centered the contemporary work policies as well as ethics and this trait was already included and specified by the Indian Knowledge

System at a time when such things were not very much prominent.

Besides the “Purva Paksha”, the Traditional Knowledge System also lays due impetus on the Vada Parampara i.e. the art of debating. Here it is worth acknowledging the fact that the Indian Knowledge System not only emphasizes the art of debate but also outlines the manner in which a healthy and amicable debate should follow. The forerunners of the Indian Knowledge System stress upon undertaking an amicable debate coupled with mutual regard, deeper inquiry and an broad mindedness. They lay impetus on the fact that one should maintain the dignity of the debating event and duly recognize the views and opinions so put forth by the opponents no matter one agrees with them or not, and this is what builds the foundation of the rules and regulations of the various debating events conducted at any levels be it local, national or international levels. These aforementioned points are not just restricted to the intellectual discussions but go beyond the boundaries of the intellectual discourse and are extendable to each and every aspect of the human life, thereby constituting Indian Knowledge System as an alive custom crucial to the contemporary society as well as the challenges being faced by it. In addition to this lies the power and strength of the Indian Knowledge System to apply spirituality as well as interdisciplinarity and integrate it with the contemporary domains of technology, governance mechanisms, science thereby fostering the pace of the holistic growth of the modern education framework thereby resonating beyond time and customs.

3. Decoding the J & K Model: Working out the Integration of Comparative Religion with the Indian Knowledge System

As an academic endeavor, the domain of comparative religion encompasses the plethora of beliefs, theories and practices of the various religious groups available at the world's disposal. It is worth stating here that the domain of Comparative Religion is nothing new to the contemporary society, it rather has its roots lying in the 19th century wherein for the first time the term “comparative religion” found a mention in the magnum opus of Max Muller who developed an insightful discourse to study and decode the religion in a comparative context. The study of this domain has emerged as an anecdote in the contemporary times as it instills a sense of empathy, eradicates all kinds of prejudices and biases and plays a pivotal role in fostering dialogue in such times when the understanding of interfaith has become quite crucial and pivotal for the maintenance of worldly peace. The study of comparative religion further fosters the inculcation of the spirit of cultural relativism rather than ethno –

centrism. Here by cultural relativism implies that one while regarding and respecting one's own religion and culture pays due respect to and understands other religions and cultures persisting in the society simultaneously and by ethnocentrism we mean demeaning or defaming other cultures, traditions as well as religions while respecting one's own culture and religion thereby considering one's own religion the supreme force guiding everyone in the society.

Via the study of comparative religion, the students can delve deeper into experiencing as well as discovering the massive scale questions put forth by various traditions on the moral, metaphysical as well as philosophical fronts. For instance it is rightly stated that all the answers to a human being's question about life as well as their very existence can be easily sought in the Bhagwad Gita. These texts including others such as the Buddhist Sutras, Jain Folklore, etc. offer varied yet crosscutting perspectives and perceptions on the notion of ethics, the notion of divinity and the very basic or fundamental aim of human existence. These texts inculcate real life instances of the various human counterparts, thereby going beyond the mundane textual analysis which aids the readers and followers to understand the logic that operates behind the observance of the plethora of rituals, festivities, and community customs and procedures thereby fostering the spirit of cultural relativism as well as mutual coexistence in the contemporary society.

There exists a very close and intimate relationship or bond amidst the Indian Knowledge System as well as the domain of comparative religion as both lay impetus onto fostering the spirit and culture of mutual respect and coexistence amidst the cultural diversity that the Indian Subcontinent encompasses. The Traditional Knowledge System's pluralistic global view – visible in phrases like: “Ekam Sat Vipra Bahudha Vadanti” (Kafeel Ahmad Bhat, 2025) (M A Islam, 2017) implying there is one truth, however the witty express or put forth it in diverse manners. This notion deeply emanates from the very objectives of the domain of comparative religion. By amalgamating both these notions i.e. the Traditional Knowledge System as well as comparative religion students can amass a broader insights of the treasure of spiritual wisdom and cultures thereby commending the already persisting array of faiths in the contemporary society. To mention here an instance of the principle of Ahimsa (non - violence) which serves as a cornerstone and epicenter around which the entire crux of the Buddhist as well as Jain literature and mythology is constructed may be superimposed or allied with the similar moral instructions of Christianity and

Islam, thereby providing the student community a detailed and transparent perspective or notion on enduring human values. Such an academic testament not only empowers the student community's academic endeavors but at the same time also instills cross faith harmony, peace as well as social cohesion. The metaphysical rigor of the Traditional Knowledge System coupled with the pertinent methods and philosophical juncture of the comparative religion constitutes an unmatched structural – functional framework for delving deeper and unfurling the man's quest for truth as well as meaning.

The amalgamation of comparative religion into the Indian Educational framework along with the notion of the Traditional Knowledge System as its subset is not merely a formality rather crucial as well as essential. This deadly mix is going to play a pivotal role in sorting out the various pressing demands and wants of the contemporary society. In a nation as culturally vibrant as Indian subcontinent, inculcating the spirit or sense of cultural relativism, spurring mutual regard amongst multiple communities is unavoidable. The domain of comparative religion can serve as an insightful tool to cover the lag in terms of the religious as well as cultural by presenting and unfurling the commonalities within diverse faith groups thereby putting a scope for a dialogue filled or empowered with cohesion.

The uprooting of the domain of comparative religion as well as the Traditional Knowledge System from the contemporary educational structural – functional framework has been instrumental in deviating the entire student community and even the teaching fraternity from enliven cultural ties. However, reinstating this mix with the contemporary educational framework will open diverse ways in which we all can enjoy and taste the richness that the Indian intellectual heritage used to offer thereby assuming pride in the fact that we have our roots implanted in the intellectually sound and rich sand of the Indian Subcontinent. This mix of the Traditional Knowledge System as well as Comparative Religion lays due impetus on the two most crucial qualities which are in demand by almost every recruiter or organization and i.e. self-introspection as well as critical inquiry. This eye-opening mix can inculcate the seed of fostering the analytical skill set as well as moral empowerment thereby nurturing the student community to easily and efficaciously decode the perplexing ethical as well as social dilemmas.

The erstwhile state of Jammu and Kashmir is evidently known for the peculiar past enriched with cross faith interaction and keeping into note the

cultural vibrancy of the erstwhile state, amalgamating and including the discipline of comparative religion can serve as a strong pillar in establishing communal harmony. Afcourse, who can forget the heinous and inhuman Kashmir riots of 1989 – 1990 when certain anti – national elements in the name of Allah resorted to brutal killings of the non – muslims regarding them as “Kaafirs”. Had this domain coupled with the Indian Knowledge System been inculcated initially itself within the nation’s educational structural – functional setup, maybe we could have foregone such brutal killings of the innocent back then. Decoding the international cultures via the lens of the Traditional Knowledge System enables students to amass requisite cultural literacy to survive in this interconnected globe. Further, it equips them to develop their personalities in a multifaceted manner and engage pro – actively in every sphere or segment be it the academics, diplomacy or multidimensional as well as culturally vibrant workplaces.

The erstwhile state of Jammu and Kashmir being the hotspot of the hermitage as well as the flag bearer of the Indian Knowledge System has initiated several steps so as to work out an amalgamation of the Traditional Knowledge System with the contemporary education’s structural – functional framework (Kafeel Ahmad Bhat, 2025). The contemporary government with adequate support and aid from the University Grants Commission has been successful in constituting a curriculum framework that engulfs a holistic syllabus in the sense that it very efficaciously balances the textual analysis along with the practical real time exposure. In this sense and direction, a plethora of courses have been initiated by the Jammu and Kashmir government such as: Comparative synthesis of sacred literature, conducting field exploration and visits to the places of adoration and worship and holding continuous and comprehensive proactive debates. As far as the faculty segment is concerned, for them certain refresher courses as well as induction training are being carried out so as to acquaint them to the techniques as well as tools to instruct upon the theories and literature constituting the Traditional Knowledge System coupled with the discipline of comparative religion. These refresher programmes not only provides the faculty with a platform to acquire the necessary instructional as well as pedagogical skill set but at the same time instills and inculcates within them the requisite level of sensitivity and depth that the teaching of the Indian Knowledge System as well as Comparative Religion demands. Various pro – active pedagogical methodologies incorporating critical delving, dialogue and regard for vibrant perspectives have been efficaciously employed while teaching the Indian Knowledge System to

the students. Several multi – media resources as well as real – time case studies have been incorporated as part of the IKS curriculum so as to make the learning of the students more practical and engaging. Regional notions like the syncretic traditions of the erstwhile state of Jammu and Kashmir have been included so as to make the context more relatable and engaging, thereby offering students with a plethora of opportunities to realize pride in the richness that their culturally rich heritage entails.

In times when wars and violence in the name of religion and culture is seen as the only option available at one’s disposal, a successfully constituted mix of the Indian Knowledge System as well as Comparative Religion can pave ways to realize the dream of a harmonious as well as an amicable society besides merely fulfilling the academic endeavors. By reconstituting the foundation of the education’s structural – functional set up, India can refurbish its intellectual assets thereby catering to the challenges and hurdles put forth by the pluralistic globe. This model holds immense significance for the contemporary Union Territory of Jammu and Kashmir wherein inculcating cross faith contexts is altogether a cultural demand as well as a walkway to enduring harmony.

Thus, in this connection in an official press release, the Jammu and Kashmir government has very well come up with the stance that as of now the domain of Comparative Religions stands launched at the college as well as university level but sooner the government will enter into due deliberation with organizations like - NCERT to introduce this course right at the school stage so that the very foundation of the students stands built with the bricks of this exemplary mix of the Indian Knowledge System as well as Comparative Religion.

It is worth stating here that recently our honorable Home Minister Shri Amit Shah inaugurated a book entitled “Jammu Kashmir and Ladakh: Through the Ages” at Delhi (News, 2025). In this event he put forth his intention of reconstituting the nomenclature of Kashmir in the name of “Kashyapa” who was a sage in ancient India and had his roots traced to Jammu and Kashmir region. He stated that there existed a time frame of approximately 150 years when history’s dimensions were restricted from Dilli Dariba to Balli Maraan as well as Lutyen to Gymkhana only and nothing beyond these set boundaries. This manipulated history was written to impress the then rulers and stay in their so called good books. But now is the need of the hour to free oneself from the clutches of this so called manipulated historical texts. Amit Shah requested all

the historians to reframe history keeping into consideration the relevant facts and figures. Amit Shah also stated that Kashmir has an in destroyable link with India. There is no denying the fact that how exploiters embezzled the various temples in Ladakh, and how mistakes were committed intentionally even after gaining independence from the painful clutches of the British Rule. The prolonged discussions encompassing, Shankaracharya, Silk Route, Hemis Math, etc. clearly proves that the very foundations of the Indian culture and hermitage was laid down in the erstwhile state of Jammu and Kashmir. This book entails and throws light on the 8000 year old history of the region resting upon well – established facts as well as figures. What made this session all the more interesting is the fact when Mr. Amit Shah stated that all the nations across the globe have geo – political existence but it is only the Indian Subcontinent in the whole globe that has geo – cultural relevance as well as existence. India right from Kashmir to Kanyakumari, from Gandhar to Odisha and from Bengal to Assam stands intimately linked via the cultural ties and bonds cthat have been created since ages. Amit Shah further stated that those who intend to define or see India in terms of the geo – political landscapes or relevance will never be able to define this culturally fond and vibrant landscape that India is home to.

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CHAPTER – 13

THE GREEN *ARTHASHASTRA*: RE-IMAGINING STATE RESPONSIBILITY IN ECOLOGICAL GOVERNANCE FOR SUSTAINABLE STATECRAFT

Dr. POUNAMI BASU

Assistant Professor, Department of Law, Brainware University,
dpb.law@brainwareuniversity.ac.in

Ms. REETA CHOUDHARY

Assistant Professor, Department of Law, Brainware University,
rec.law@brainwareuniversity.ac.in

Ms. RITUPARNA HALDER

Assistant Professor, Department of Law, Brainware University,
rph.law@brainwareuniversity.ac.in

1. Introduction

Amidst urbanization and mounting environmental challenges, there is an urgent need to explore ethical frameworks that not only restore ecological balance but also promote sustainable human practices as we walk on the path

of socio-economic development. Human beings have recently recognized that their actions in nature have seriously harmed the balance in the ecosystem and have caused socio-economic inequities. This understanding then prompted others to investigate how additional harm to the environment could be avoided, or in what ways contributions can be made to foster ecological reconstruction and promote sustainable and holistic development. To help shield future generations from ecological dangers and disasters, the advancement of environmental ethics was considered equally necessary amid the fast-paced processes of urbanization and industrialization in a globalized world. The first significant conference on environmental issues organized by the United Nations was the UN Conference on the Human Environment, held in Stockholm, Sweden, in 1972. The Stockholm Declaration and Action Plan, outlining principles and guidelines for the preservation of the human environment, was adopted at this conference. The Earth Summit in Rio de Janeiro, Brazil, was organized in 1992 to promote ecological understanding, and it laid down principles for environmental sustainability, reflecting the traditions and practices for environmental protection found in ancient India. India's rich philosophical tradition has also discussed the nature of the relationship that should exist between humanity and nature and has outlined various moral principles and guidelines to prevent the destruction of nature and the overexploitation of resources for fulfilling human needs (Habib, 2010; Gadgil & Guha, 1993). It is therefore imminent that a deeper examination of these principles and practices is made, as important lessons can be drawn from ancient texts and literature that hold contemporary relevance for shaping policy frameworks on global environmental challenges and can inform governmental approaches on ecological governance (Bhatt, 2025).

2.Religion and Environment

Environmental ethics encompasses the moral principles and responsibilities humans have toward the natural world and all living things. However, religion is often viewed as the most common framework for moral reasoning and ethical choices. Religious philosophies have offered different explanations of the creation of the physical world and have interpreted the close relationship between humans and nature. Irrespective of these variations, the majority of religious faiths share a dedication to conserving and safeguarding the natural world. The conviction that natural elements are sacred and intrinsically linked to the Higher Power is the foundation of the nature of reverence for the environment. Certain plants, animals, and entire landscapes are considered sacred in various religions because they represent the divine or are symbolic of

specific deities. This respect has been codified over time in ideas and spiritual practices that support worship of nature and its various elements. The concept of human-nature interconnectedness is firmly ingrained in the philosophical and theological systems of ancient India, making it no exception.

The Vedic literature has emphasized the importance of woods, trees, and other natural resources in the continuation of human existence. An early awareness of environmental balance and sustainability is seen in the *Rig-Veda's* observation of nature's potential to affect fertility and climate (Patra, 2016). The concept of 'dharma' as a moral duty expands human responsibility beyond society to include the natural world, encompassing both living and non-living beings. It represents a universal code of conduct that aligns human actions with the cosmic order (*ṛta*), natural law, upholds truth, and obliges the man to maintain harmony within the ecosystem. Failing to do so or engaging in activities that result in environmental damage are seen as acts of *adharma*. The ancient Indian vision rejects the idea of human exploitation of nature and considers the various elements of nature as sacred and animate, necessitating ethical treatment of all life forms as part of a larger cosmic kinship, which is reflected in the Vedic ideal of 'oneness' of *Vasudhaiva Kutumbakam*. The earth is honored and protected as a mother in ancient Indian literature, and its destruction would amount to her dishonor. The *Atharvaveda* looks at the planet Earth as "bhoomi mata putroham prithivyah," that has to be revered and protected against any form of destruction or exploitation. Several communities in different parts of India have a long-standing tradition of love and respect for nature, which draws upon religious teachings, customs, and rituals. Environmentalism is strongly supported and promoted by all Indian faiths and religious traditions, which develops an innate connection between the common man and nature (Guha, 2006; Sharma, Aggarwal, and Kumar, 2014; Altekar, 2021). In Vedic literature, particularly the *Rig Veda*, trees, rivers, mountains, and animals are not inert resources but manifestations of a singular, divine reality (Brahman). The five elements of nature (earth, fire, water, air, and space) are not only physical constituents but sacred forces to be revered and protected. Pipal trees, banyan trees, rivers, and cows are not only valued for their utility but are also worshipped for their spiritual value. The *Atharvaveda* emphasizes the significance of preventing water pollution by discussing the beneficial properties of pure water and implying that it has the ability to cure illnesses. The air is described as a fluid embalming that delivers health and gladness to human hearts in certain *Rigvedic* hymns, which also allude to the air's therapeutic properties. Similarly, the *Atharvaveda's* Prithvi Sukta, which asserts that humans

and the earth have a mother-child relationship, is arguably one of the oldest invocations of Mother Earth (Verma, 2022). The engravings and depiction of the elements of nature into temple architecture and rituals also reflect how environmental values are woven into the social fabric of Indian society and have been transmitted across generations.

Ancient wisdom in India has its roots in different religious philosophies and traditions. Ahimsa, or non-violence, is emphasized in Jainism, which promotes restraint, tolerance, compassion, simple living, and respect for all forms of life on earth. The Jain teachings of *Anekāntavāda*, which means many-sidedness, and *Parasparopagrāho Jīvanam*, which refers to the mutual interdependence of life, promote a worldview based on humility and ecological sensitivity (Ravikant, 2021). Similarly, Buddhism introduces a mindful and compassionate approach to nature. Its core principles identify greed, ignorance, and desire as primary factors that result in environmental degradation, thereby urging men to practice moderation, detachment, and support ethical awareness.

India's constitutional and legal frameworks echo the customary practices and value systems of the Indian society. The Judiciary in India has reflected upon dharmic principles in

environmental law, while supporting the rights of tribal communities and indigenous people, advocating for sustainable utilization of natural resources, and promoting awareness and caution about the environmental impact of urbanization and development. Laws such as the Forest Rights Act, 2006, Biological Diversity Act, 2002, and National Water Policy, 2016, besides key rulings on ecological protection, demonstrate how India's traditional perspective continues to influence the country's approach to addressing contemporary environmental issues and shapes its stance on climate justice and protection of rights of indigenous communities whose livelihood and existence are intrinsically linked to their surrounding ecosystem.

While there exists a rich reservoir of ancient texts and literature on statecraft and governance, the *Arthashastra* written by *Kautilya* (also referred to as the seminal document outlining principles and diplomatic tactics of *Chanakyaniti*), remains an important text when it comes to laying down principles on economic stability, military strategy, diplomatic practices, and environmental conservation by the rulers for public welfare in ancient India. Kautilya, the philosopher, economist, and strategist, was the Chief Minister and strategic advisor to Chandragupta

Maurya, who was the first ruler of the Mauryan Empire (4th century CE). Kautilya's ideas on statecraft can be traced back to different Indian intellectual and religious traditions like the Vedas, besides being influenced by the teachings of Jainism and Buddhism, which include profound discussions on ecological ethics and conservation practices. Kautilya's emphasis on the treasury and the need to strengthen the economic stability of the state also covered discussions on the economic importance of land, forest, and animal welfare. Elements of the environment were seen as an important source of revenue generation or making significant contributions to augmenting the strength of the armies on the battlefield. Chandragupta Maurya's grandson, Emperor Ashoka, played a pivotal role in the spread of Buddhism, and his exercise of power and administrative style made a selective merger of certain 'common features' of both Kautilyan and Buddhist political thought (Shahi, 2019), which had a lasting impact on the evolution of administrative thinking and governance in Indian society. The environment has been an integral theme in writings on the statecraft and welfare policies of the state. Ancient concepts and approaches to ecological conservation, embedded in religious texts, philosophical thought, and ancient literature, can therefore guide human behaviour and shape contemporary public policies relating to the protection of the environment and animal welfare.

3. Environmental Ethics in the *Arthashastra*

Kautilya recommends several laws and strict rules for forest conservation, patterns of land use in a sustainable way, and the utilization of natural materials, fodder, and resources in a non-exploitative manner. He emphasized that land should remain fertile not only to sustain the native population but also to support migrants during calamities. He connected the productivity of land to its natural beauty and whether it can generate economic activities that can contribute to financial riches, thereby linking environmental management directly to ensuring fiscal stability and the strength of the state. He discussed the imposition of hefty fines on offenders who neglected the motherland, or cut down cremation grounds, or uprooted trees in places of pilgrimage or royal forests, and destroyed sacred groves. He made provisions for the development of water storage reservoirs and demanded that people contribute to the maintenance of the landscape because he believed that agriculture and water resource management were crucial (Rangarajan, 1992).

According to Kautilya, the support of agriculture, the collection of taxes, and the maintenance of economic balance are all dependent on fertile lands.

His ideas on forest conservation, water management and agriculture, biodiversity conservation, and resource management are explored to comprehend their relevance in modern times for ecological governance and policy framing.

• **Forest Conservation**

In ancient times, forests were considered a vital resource for providing fuel, timber, fodder, and livestock, and both forests and grazing lands were seen as sources of generating revenues for the treasury. Importance was given to using forest products responsibly. In Ashoka's regime, emphasis was placed on creating animal parks on non-agricultural lands and providing protection for animals, where they are treated with utmost care. Multiple efforts were made to conserve the forests and to protect the pastures through planting trees, as well as the dry lands for grazing cattle. Kautilya not only focused on the management of forests, but orchards and gardens, as all of these were sources of revenue as well as used as recreational spots. Through various representatives, a king must protect the environment, ecology, and other natural resources. In the *Arthashastra*, we find the mention of the appointment of state officials for environmental conservation and management of forests (Shahi, 2019; Kumar & Narain, 2019).

There was also a separate post called Director of Forests created, whose role was also to supervise the slaughter of animals, cattle and pastures. Different posts were created to look into the rearing of calves and bullocks, and buffalo, and they were also responsible for putting the names of these animals in the register; to manage young, old, and milky cows and protect them; and to care for horses and maintain their food management. Kautilya was also the first thinker to develop the *Hasti-Shastra* or 'Elephantology', denoting the science of elephant conservation. Forests also supplied elephants that would be used by the armies, and strengthen the defence of the empire. Kautilya recommended setting aside one and a half hours every day (the seventh part) to "superintend elephants, horses, chariots, and infantry" for the King. The King also had to take care of the elephant forests, as his stock of elephants could be replenished from these forests. The penalty for killing an elephant was death, which shows that elephants were highly valued in the Mauryan empire.

For Kautilya, it was the responsibility of the ruler to protect the mines, irrigation works, forests, elephant forests, and create new ones. Kautilya noted that the state made forest preservation a guiding priority. The Mauryan period saw the first effort at a tax on the production of crafts and forests in Indian

history, emphasising the need for both grazing and forest lands to produce income for the treasury. Additionally, if the trees in hermit forests, cremation sites, and pilgrimage sites were destroyed, heavy fines were to be imposed on the offenders.

• *Water management and Sustainable agriculture*

The state also initiated irrigation projects for efficient water use for agricultural purposes. The construction of embankments to collect rainwater was a common irrigation method. Both natural resources, like rivers, lakes, springs, and manmade tanks, reservoirs, and wells, were used for irrigation. Through the various *sutras* in different chapters, it has been informed that people were aware of rainfall regimes, different types of soil, and suitable techniques of irrigation. In order to reduce environmental hazards, Kautilya suggested irrigation systems, food storage, and forest management (Shiva, 2002; Singh, 2021). He acknowledged the significance of disaster preparedness and agricultural resilience. He emphasized crop rotation, afforestation, and soil conservation, and emphasized the importance of adopting sustainable farming practices. The *Arthashastra* recommends strict penalties for polluting water sources and air. It also includes urban planning measures to improve sanitation and public health.

• *Biodiversity conservation*

Kautilya talked about three kinds of forests. One is devoid of beasts, and for the sages to meditate in. The second is for the king for hunting, which is full of tigers, elephants, bison, and other prey animals. The third one is for the ordinary masses to understand nature. The *Arthashastra* demonstrates the importance and care attached to animals, domestic and wild animals, plants, and vegetation. There were fines and punishments imposed for hurting the living creatures (Verma, 2022; Baviskar, 2020). Various state officials- Director of Forests, superintendent of cattle, horses, and elephants were responsible for protecting wildlife, providing proper rations for pet animals, preventing poaching of wild animals, regulating grazing, and taking care of domesticated animals.

Non-agricultural lands were being utilized for animal parks, where the safety of animals was taken care of. The capturing, hunting, and killing of animals were prohibited in these sanctuaries. Tiger hunting was allowed in the *Arthashastra*, and even bounties were offered at times for killing a tiger. Cutting down trees also led Kautilya to emphasize the preservation of those trees that bore fruit,

flowers, and provided shade. Among the material forests, the large ones that were filled with resources and were accessible and watered by a river were given primary importance. Roads, businesses, residential buildings, cemeteries, and other structures should all be built with no harmful impact on biodiversity or the environment. Every home should have adequate fire safety measures in place, according to Mauryan law. Every home must also have the necessary infrastructure in place for appropriate sewage and waste, and garbage removal. Any kind of infraction of these regulations was punishable by law.

• ***Sustainable Resource Management***

To maintain long-term environmental and economic stability, Kautilya promoted the prudent management and responsible utilization of natural resources, such as forests, water, and land.

Concerns about climate change, biodiversity loss, and sustainable agriculture are all addressed by his initiatives on afforestation, irrigation systems, and the regulation of agricultural activities. Like contemporary government initiatives addressing deforestation, pollution management, and the adoption of renewable energy, the *Arthashastra* encourages state action in environmental conservation. State intervention was crucial in preventing the overexploitation of resources and in conserving the environment, which aligns with current conservation strategies (Patra, 2016; Sivaramakrishnan, 2011).

• ***Disaster Preparedness and Relief Measures***

Kautilya was also conscious of natural calamities and ways to properly manage these, as these might destroy the crop produce and lead to loss of livelihood. Famines, fires, outbreaks of epidemics, and diseases were further identified as other calamities affecting people's lives. Ensuring relief measures were considered necessary to be provided during famine, besides storing and providing food to the people. He also indicated measures to protect people during fire accidents.

4. India's Environmental Policy: Reflections of Kautilya's Ecological Vision

India's environmental governance framework includes a complex intersection of constitutional provisions, statutory laws, judicial interventions, and compliance with international norms and agreements. The moral obligation towards the protection of nature is embedded in India's civilizational ethos, which looks at the natural world as sacred and integral to ensure human welfare.

The ecological insights articulated in Kautilya's *Arthashastra* resonate deeply in current environmental policy, offering both philosophical wisdom and practical lessons for integrating sustainable solutions to environmental challenges. Kautilya's emphasis on forest conservation, water management, biodiversity preservation, and sustainable resource utilization, it is possible to draw linkages between ancient practices of statecraft and the objectives of current Indian policies and laws (Guha, 2006; Gadgil & Guha, 1993).

Kautilya's '*rajdharma*' entrusted the ruler with the responsibility to preserve natural resources for the well-being of the present and future generations. Similar provisions have been included in the Constitution of India under the Directive Principles of State Policy. Article 48A of the Directive Principles of State Policy provides for the protection and improvement of the environment by the State and for safeguarding the forests and wildlife of the country. Article 51A(g) states that protection and improvement of the natural environment is the basic duty of all citizens, including lakes, rivers, forests, and wildlife. All these provisions reflect *the Arthashastra's emphasis* on the cooperative engagement of the ruler and the common people in maintaining ecological balance.

This ecological sensitivity has also been reified through important court rulings. The Supreme Court, in cases such as *M.C. Mehta v. Union of India* (1987), which spans various rulings such as the judgment on the Ganga pollution case (1988 AIR 1037) and *Subhash Kumar v. State of Bihar* (1991) 1 SCC 353, has expanded the right to life under Article 21 to encompass the right to a clean and healthy environment. This aligns with Kautilya's view that caring for the environment is critical to ensure state stability, provide a healthy environment for people to live in, and promote public welfare.

▪ ***Forest Conservation and the Forest Rights Act***

Kautilya highlighted the importance of forests as an important source of livelihood and biodiversity, and he considered them integral to enhancing the state's military strength. He established specific roles, such as the Director of Forests, to ensure sustainable management and prevent exploitation of forest resources. India's Forest Conservation Act of 1980 and the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act of 2006, commonly known as the Forest Rights Act, also incorporate these ideas. While Kautilya stressed state control to protect forests, there is also recognition being given to the customary rights of tribal and forest-dwelling communities.

Both approaches recognize that forests are not merely economic resources; they are also essential ecological lifelines. The National Afforestation Programme and the Green India Mission under the National Action Plan on Climate Change (NAPCC) further support the conservation principles found in the *Arthashastra*.

▪ ***Water Management and the National Water Policy***

Water has always played a vital role in supporting agriculture and shaping the strength of our economy—a fact recognized centuries ago in the *Arthashastra*. Kautilya, its author, advocated for practical measures like building irrigation systems, constructing embankments to prevent floods, and even imposing fines on those who polluted precious water sources. These ancient ideas still resonate today. For example, the National Water Policy (2012) calls for everyone to work together in managing water resources wisely, involving local communities in irrigation, and protecting water quality. India’s courts have even declared rivers like the Ganga and Yamuna as “living entities,” echoing the age-old tradition of revering rivers as sacred. More recently, the Jal Jeevan Mission (2019) aims to bring safe drinking water to every rural household—a modern echo of Kautilya’s belief that the state must provide fair access to water and protect public health.

▪ ***Sustainable Agriculture and Climate Resilience***

Kautilya’s advice on crop rotation, soil conservation, and preparing for disasters shows his practical and balanced approach for protecting the environment. Such ideas have been integrated into contemporary policies like the National Mission on Sustainable Agriculture (NMSA), part of the NAPCC, which supports soil health management, rainwater harvesting, and climate-resilient crops. The Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) also focuses on irrigation efficiency, which parallels Kautilya’s ideas on maximizing agricultural productivity without overexploiting natural resources. Kautilya’s linkage of fertile land to state prosperity resembles modern food security policies, where sustainable farming practices are framed not only as ecological imperatives but also as national economic priorities.

▪ ***Biodiversity Conservation and the Biological Diversity Act***

The *Arthashastra* imposes penalties for harming animals and cutting trees, and it prohibits poaching while creating wildlife sanctuaries. This anticipates modern instruments such as the Biological Diversity Act, 2002, which provides for the conservation of biodiversity, sustainable use of its components, and

equitable sharing of benefits. Similarly, the Wildlife Protection Act, 1972, institutionalizes the protection of species and ecosystems, much like the Arthashastra's classification of forests into different functional categories. India's National Biodiversity Action Plan (2019) also resonates with Kautilya's framework by linking conservation with livelihood security and climate adaptation strategies.

The ecological administration of Kautilya is inextricably linked to religious and cultural traditions that revered nature. Policies that acknowledge holy trees, community-led conservation, and environmentally sensitive areas surrounding pilgrimage sites all demonstrate this cultural continuity. Similar to how the Arthashastra recognizes regional practices and rituals in environmental management, the National Biodiversity Strategy and Action Plan also acknowledge traditional ecological knowledge.

▪ ***Pollution Control and Urban Governance***

Kautilya stressed sanitation in urban design and proposed severe fines for air and water pollution. This is aligned with contemporary laws such as the Environment (Protection) Act of 1986, the Air (Prevention and Control of Pollution) Act of 1981, and the Water (Prevention and Control of Pollution) Act of 1974. The *Arthashastra's* interest in waste disposal and fire prevention aligns with contemporary initiatives, such as the Swachh Bharat Abhiyan, which prioritizes solid waste management, sanitation, and urban public health. Kautilya's demand for controlling businesses and residential development to reduce environmental damage anticipates existing environmental impact assessment (EIA) procedures under regulatory regulations.

▪ ***Disaster Preparedness and Relief***

Kautilya foresaw natural disasters such as famines, floods, and epidemics and proposed stockpiling food and implementing relief operations. The same steps are enshrined in India's Disaster Management Act, 2005, mandating preparedness, disaster risk reduction, and relief after a disaster.

Kautilya's vision of integrating disaster management into the state is evident in the National Disaster Management Authority's (NDMA) focus on resilience and mitigation (Singh, 2021).

▪ ***Climate Change and Global Commitments***

Even though climate change as a theory was not recognized by Kautilya, his

prescriptions on irrigation, afforestation, and prudent use of resources offer a proto-framework for climate resilience. India's National Action Plan on Climate Change (2008) and the State Action Plans reflect the same spirit by promoting afforestation, renewable energy, and sustainable agriculture. Kautilya's vision of harmonizing economic growth with ecological conservation informs India's negotiating strategy in international climate forums, where India underscores "common but differentiated responsibilities" and equity. Prime Minister Narendra Modi has emphasized the significance of green jobs to combat climate change and has focused on 'green growth' that ensures employment opportunities while ensuring environmental protection. He has reiterated India's commitment to assuming a global leadership role in green hydrogen production, industrial decarbonization, and women-led climate change action, and environmental conservation under the mantra of *Seva* (public service) and *Sushasan* (good governance). India has also been the only country among the G-20 nations to achieve its Paris Accord goals, and thereby it is not only participating, but shaping the global conversations on climate change.

5. Conclusion

The *Arthashastra* shows that ecological sensitivity and sustainable administration were woven into the very fabric of ancient Indian statecraft. Its emphasis on conserving forests, protecting biodiversity, managing water resources, ensuring agricultural resilience, and preventing pollution reveals an integrated vision whereby environmental management was inextricably linked with political stability and economic prosperity. These concepts resonate with the priorities of present environmental policies in India, safeguarded through constitutional guarantees, judicial pronouncements, and legislation. By aligning Kautilya's insights with constitutional provisions, statutory laws, and policy frameworks, one discerns not only historical continuity but also cultural legitimacy for contemporary environmental governance.

At a time when technocratic and market-driven solutions often dominate climate and environmental debates, revisiting Kautilya's wisdom underscores the moral and cultural grounding necessary for effective ecological stewardship. The *Arthashastra* reminds us that sustainability is not a modern imposition but a civilizational inheritance, one that continues to shape India's environmental policy in the 21st century. In an era of climate change, resource scarcity, and urban encroachment threatening the world order, Kautilya's thoughts reify that sustainability is not a contemporary discovery but a civilization legacy. By going

back to this ecological thought and reinterpreting it, India can base its environmental policy and climate action programme on cultural practices and traditions while bringing new ethical insights to sustainability discourse. Finally, the

Arthashastra reiterates that ecological responsibility is at the heart of *rajdharmā*—the state's duty—and that effective statecraft requires reconciliation of economic progress with ecological justice for the welfare of both current and future generations (Habib, 2010; Baviskar, 2020; Bhatt, 2025).

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CHAPTER - 14

VEDANTA TO VIRTUAL REALITY: CONSCIOUSNESS IN THE AGE OF TECHNOLOGY

Dr. DEBDAS MONDAL

Librarian, S.R Fatepuria College, West Bengal, India
research.libraryscience24@gmail.com

1. Introduction

The concept of consciousness has long fascinated philosophers, scientists, and spiritual seekers. While modern science explores consciousness through neural correlates and cognitive models, Vedanta—a school of Indian philosophy rooted in the Upanishads—presents a non-dualistic perspective, positing consciousness as the fundamental reality. In the age of artificial intelligence, virtual reality, and neural interfaces, our understanding of consciousness is both expanding and being challenged. This paper examines how Vedantic thought can offer critical insight into the evolution of consciousness in a technologically saturated era.

2. Vedantic View of Consciousness

Vedanta, especially Advaita Vedanta, posits that consciousness (referred to as *Chaitanya* or *Atman*) is the sole unchanging reality, with the material world being *Maya* or illusion. According to Adi Shankaracharya, self-realization arises from the discernment between the self (*Atman*) and non-self (*Anatman*). This self is not the ego or mind but pure, formless, unbounded awareness. The Upanishads famously declare, "*Tat Tvam Asi*" (That Thou Art), suggesting the unity of individual and universal consciousness.

3. Consciousness in Modern Science and Technology

Modern neuroscience and cognitive science tend to define consciousness in terms of wakefulness, self-awareness, and the capacity for subjective experience. Integrated Information Theory (IIT), Global Workspace Theory (GWT), and computational models attempt to decode how consciousness emerges from neural activity. Meanwhile, AI researchers are grappling with machine consciousness and artificial general intelligence (AGI), pondering whether machines can ever truly be sentient or self-aware.

Virtual Reality and Augmented Reality technologies, on the other hand, offer simulations that increasingly blur the lines between reality and illusion, echoing the Vedantic concept of *Maya*. As users immerse themselves in digital worlds, questions of self, embodiment, and perception take centre stage.

4. Literature Review

Several scholars have explored intersections between Eastern philosophy and contemporary cognitive science. Varela, Thompson, and Rosch (1991) in *The Embodied Mind* highlighted Buddhist and Vedantic parallels to enactive cognition. Evan Thompson (2007) further developed these ideas in *Mind in Life*, advocating for a non-dual perspective in understanding mind and consciousness.

Tart (1990) discussed states of consciousness and altered realities, suggesting that technology may simulate or facilitate such states, reinforcing Vedantic ideas of illusory perceptions. Kurzweil (2005), in *The Singularity is Near*, predicted a convergence between human and machine consciousness, proposing a technological transcendence reminiscent of spiritual enlightenment.

Recent works, such as Metzinger's *The Ego Tunnel* (2009), argue that the sense of self is a construct—a thesis echoed in Vedanta's *Neti Neti* ("not this,

not this”) method of discerning the true self. Meanwhile, virtual reality research by Slater (2009) explores how immersive technologies can manipulate subjective realities, providing modern parallels to ancient philosophical explorations of perception.

5. From Vedanta to Virtual Reality: Bridging the Gap

The advent of immersive technologies and neural interfaces forces us to reconsider what constitutes 'reality' and 'self'. Vedanta's assertion that the empirical world is *Maya* resonates deeply with contemporary concerns about simulation, artificial environments, and mediated experiences. For instance, the idea that the world is a projection of consciousness mirrors current theories in digital realism, where our perceptions are increasingly shaped by algorithms and screens.

Furthermore, the Vedantic notion that consciousness is the substratum of all experience suggests that rather than trying to create consciousness artificially, technologists might focus on understanding and amplifying it. Meditation apps, biofeedback devices, and neural headsets already attempt to enhance awareness, albeit within a materialist framework.

6. Philosophical Implications and Ethical Considerations

The convergence of technology and consciousness raises significant ethical and philosophical questions. If consciousness is not a byproduct of matter but its foundation, then creating machines that simulate or potentially host consciousness challenges our understanding of life, personhood, and rights.

Vedanta warns against confusing the transient ego-self with the true Self. Similarly, if virtual identities, avatars, and digital consciousness become central to existence, society may face crises of authenticity, alienation, and ethical dissonance. The ancient guidance of *Viveka* (discernment) becomes crucial in navigating these new realities.

Moreover, technological advancements can either support the expansion of consciousness through mindfulness tools, digital sacred spaces, and global connectivity or entrap it in cycles of distraction and delusion. The path of discernment outlined in Vedanta can serve as a compass.

7. Future Directions and Technological Integration

As we advance toward integrating AI, VR, and brain-computer interfaces

into daily life, a Vedantic framework can offer a grounding philosophy. Educational programs, technological design, and policy-making can benefit from incorporating ethical and metaphysical insights from Vedanta.

Future research can explore practical applications of Vedantic practices in digital well-being, such as integrating non-dual awareness into user interface design, or employing contemplative technologies to guide users toward self-realization. The synthesis of ancient philosophy with cutting-edge science could redefine not only our understanding of consciousness but also the future of human evolution.

8. Conclusion

From the ancient wisdom of Vedanta to the frontiers of virtual reality and artificial intelligence, the quest to understand consciousness remains humanity's most profound pursuit. While technology may simulate or extend aspects of consciousness, Vedanta reminds us that true awareness transcends all forms and phenomena. By bridging these worlds—philosophical and technological—we not only gain insights into consciousness but also foster a more holistic, ethical, and awakened future.

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CHAPTER - 15

INTELLECTUAL PROPERTY AND TRADITIONAL KNOWLEDGE: THE LEGAL CHALLENGE OF PROTECTING INDIA'S WISDOM

Dr. RIYA BANERJEE

Assistant professor of law, JIS University, Kolkata

Email- visitriya50@gmail.com

1. Introduction

India's vast intellectual heritage includes systems like Ayurveda, Yoga, and indigenous ecological practices—forms of Traditional Knowledge (TK) passed down orally through communities (Gupta, 2012). Rooted in collective experience, TK is rarely documented or individually owned.

Modern Intellectual Property Rights (IPRs), however, focus on novelty, fixed ownership, and limited terms—making them incompatible with TK's communal and evolving nature (Dutfield, 2000; Ghosh, 2003). This mismatch has exposed TK to biopiracy—such as patents on turmeric and neem—triggering public and legal pushback (Shiva, 2001).

To combat this, India created the Traditional Knowledge Digital Library (TKDL), which helps block illegitimate patents by documenting ancient knowledge (TKDL, 2022). Yet, TKDL doesn't grant ownership or benefits to original communities (Chander and Sunder, 2004).

India's obligations under the TRIPS Agreement further limit its flexibility, as TRIPS prioritizes standardized IP norms that overlook the cultural roots of TK (Correa, 2002; Commission on IPR, 2002). Though laws like the Biological Diversity Act (2002) and ABS rules exist, weak enforcement and low public awareness reduce their impact (Kumar and Choudhary, 2015).

This paper calls for a *sui generis* legal framework grounded in Indian values like dharma (ethics) and social justice. Such a system would better protect TK, empower knowledge-holders, and uphold India's cultural sovereignty in the face of global IPR pressures.

2. Understanding Traditional Knowledge: Features and Scope

2.1. Defining Traditional Knowledge

Traditional Knowledge (TK) refers to the collective wisdom and practices of indigenous and local communities, passed down through generations. Rooted in daily life, it shapes rituals, language, farming, medicine, and climate understanding (WIPO, 2019). Unlike formal science, TK is unwritten, community-owned, and shaped by lived experience (Posey, 1999). It is deeply tied to cultural identity and spiritual values, making its commercialization not just a legal concern but also an ethical and cultural one (Shiva, 2005).

2.2. Core Characteristics of Traditional Knowledge

Traditional Knowledge (TK) in India differs fundamentally from Western IPR systems. It is collectively owned, developed through generations of shared experience—unlike IPRs, which focus on individual authorship and exclusivity (Blakeney, 2006). TK is mostly oral, preserved in stories and practices, making it hard to meet patent requirements like novelty and fixed inventorship (Ghosh, 2003). Passed down through rituals and apprenticeships, its legal origins are difficult to trace (Kuruk, 2007). TK is also deeply cultural and sacred—Ayurveda, for instance, blends health with spiritual philosophy (Rao, 2004). Importantly, TK is dynamic, evolving with local needs. Tribal communities in Odisha, for example, have modified seed storage to adapt to climate change (Gupta, 2012). These features make TK incompatible with rigid IPR frameworks focused on static, individual ownership.

2.3. Scope of Traditional Knowledge in India

India's vast cultural and ecological diversity has fostered rich Traditional Knowledge (TK) across various fields. In healthcare, systems like Ayurveda, Siddha, and tribal medicine blend codified texts like the Charaka Samhita with orally preserved remedies (Mukherjee and Wahile, 2006). Agriculture and food systems include water management methods such as Rajasthan's Johads and Nagaland's Zabo, along with local knowledge of pest-resistant crops and seed saving (Baviskar, 2003). In art and culture, folk traditions like Madhubani painting, Chhau dance, and Pattachitra reflect deep ties to mythology and ritual (Banerjee, 2013). Environmental conservation is seen in practices like sacred groves and the Bishnois' tree-protection rituals—showing ecological insight that predates modern science (Gadgil and Berkes, 1991).

2.4. Relevance of TK to Modern Science and Sustainable Development

Traditional Knowledge (TK) offers valuable solutions for climate action, biodiversity conservation, and sustainable living. It supports eco-friendly farming, holistic health, and low-impact lifestyles aligned with global sustainability goals (Berkes, 2008). The UN recognizes TK's role in achieving the SDGs, especially in health, environment, and cultural preservation (UNESCO, 2017).

Yet, despite growing acknowledgment, TK is often sidelined in legal and scientific systems. Its misuse without fair recognition or benefit-sharing reflects “epistemic injustice” (Fricker, 2007). This calls for inclusive legal frameworks that truly respect and protect community-based knowledge.

3. The Inadequacies of the Modern Intellectual Property Rights Regime in Protecting Traditional Knowledge

3.1. The Philosophical Clash: IPR Individualism vs. Communal Knowledge

Modern IPR systems clash with Traditional Knowledge (TK) due to differing philosophies—IPRs prioritize individual, time-bound ownership, while TK is collective, timeless, and culturally rooted (Dutfield, 2000). For example, India's Vedic traditions attribute knowledge to rishis, not individuals, making them incompatible with TRIPS requirements of novelty and clear inventorship (Rao, 2004; WTO, 1994).

3.2. Structural Barriers in Patent Law

Patent law struggles to protect Traditional Knowledge (TK), which often lacks the novelty and documentation required by laws like Section 2(1)(j) of the Indian Patents Act, 1970. Much of TK, passed down orally or in ancient texts, fails modern patent tests. In *AyuTech Pharma v. Union of India* (2009), the Delhi High Court noted Ayurveda's vulnerability due to poor documentation. Cases like the turmeric patent (USPTO No. 5,401,504), later revoked using Sanskrit texts, show how TK can be misappropriated and patented abroad (Ganguli, 2001).

3.3. Biopiracy and Misappropriation

Biopiracy—using traditional knowledge and biological resources without consent or compensation—highlights flaws in the IPR system. Patents on Indian plants like neem, basmati, and karela by foreign entities occurred without community benefit (Shiva, 2001). In the landmark *Neem Patent Case* (EPO Patent No. 436257), the European Patent Office revoked a patent by W.R. Grace, citing lack of novelty since Indian farmers had used neem for centuries (Bodeker, 2007). Such cases violate Article 8(j) of the CBD, which mandates fair benefit-sharing with knowledge holders.

3.4. Ineffectiveness of Copyright and Trademark in TK Context

While some argue for using copyright or trademarks to protect TK, these mechanisms are equally problematic. Copyright, for instance, protects “original works” for a limited time—usually the author's lifetime plus 60 years (Indian Copyright Act, 1957). Since TK is anonymous and ancient, it falls outside copyright scope unless it is fixed in a tangible medium and attributed to a specific author or organization.

Similarly, trademark law only protects symbols, signs, and names used in commerce. While Geographical Indications (GI)—such as Darjeeling Tea or Kanjeevaram Sarees—do offer some limited recognition to regional artisans and cultural products, they do not protect the knowledge system as a whole (Das, 2010). For example, GI may protect the branding of ‘Darjeeling Tea’ but not the methods of cultivation or biodiversity knowledge passed down through generations of tea growers.

3.5. Inadequacy of International Treaties: The TRIPS Dilemma

India's adherence to the TRIPS Agreement presents a complex challenge in protecting Traditional Knowledge (TK). Although Article 27.3(b) permits

member states to exclude certain biological materials from patentability and suggests developing *sui generis* systems, it provides limited safeguards for community-held TK. This legal ambiguity has enabled corporations to commercialize indigenous knowledge and resources without proper consent or benefit-sharing. The slow progress of WIPO's Intergovernmental Committee (IGC) and lack of binding international norms have further exacerbated this issue (WIPO, 2020). In global forums, India has consistently advocated for reforms such as mandatory disclosure of origin, prior informed consent, and equitable benefit-sharing in patent applications. However, these proposals have faced resistance from economically powerful nations that benefit from the existing system (Gervais, 2005).

3.6. Need for a *Sui Generis* Regime

Existing IPR laws inadequately protect Traditional Knowledge (TK), prompting calls for a *sui generis* system. Such a framework would:

- Recognize collective, intergenerational ownership;
- Provide perpetual protection;
- Integrate oral traditions and community laws;
- Ensure benefit-sharing and prior informed consent.

India's efforts—like the Biological Diversity Act (2002) and TKDL—are notable but largely defensive. They prevent patent misuse but don't fully empower communities with legal rights (Rai and Chandra, 2020).

4. Legal Frameworks in India and the Global Arena

4.1. Indian Legal Frameworks

India has made notable strides in crafting laws to protect its traditional knowledge (TK), especially in response to historical injustices like the turmeric and neem patent controversies. These legal responses reflect a broader ambition to assert knowledge sovereignty and prevent the commodification of community heritage.

4.1.1. The Biological Diversity Act, 2002

The Biological Diversity Act (BDA), 2002, aligns with the Convention on Biological Diversity and protects India's biological resources and traditional knowledge (TK). It mandates prior informed consent and benefit-sharing (Sections 3–6), and operates through a three-tier system: the National Biodiversity Authority, State Boards, and local Biodiversity Management

Committees. Though its Access and Benefit Sharing (ABS) model aims to empower local communities, implementation is hindered by low awareness, limited legal capacity, and challenges in formalizing oral traditions (Sahu, 2012).

4.1.2. Traditional Knowledge Digital Library (TKDL)

The Traditional Knowledge Digital Library (TKDL), launched in 2001 by CSIR and the Ministry of AYUSH, aims to curb misappropriation of Indian TK by digitally recording over 290,000 formulations from Ayurveda, Unani, Siddha, and Yoga in multiple global languages (Pushpangadan and Nair, 2005). It serves as a defensive tool, helping patent examiners reject false claims. By 2023, it had blocked over 200 wrongful patent applications (CSIR, 2023). However, TKDL doesn't grant positive legal rights to communities—it only stops external patenting.

4.1.3. The Protection of Plant Varieties and Farmers' Rights Act, 2001

India's PPV&FR Act uniquely gives equal legal status to farmers' and breeders' rights, recognizing farmers as key custodians of agro-biodiversity (Singh and Basu, 2011). It allows farmers to freely save, use, exchange, and sell seeds, preserving traditional practices despite IPRs. However, its impact is limited due to low awareness and poor enforcement in rural areas (Bhutani, 2014).

4.2. Limitations in India's Legal Response

Despite existing laws like the BDA and PPVFR Act, India lacks a unified legal framework to protect all forms of Traditional Knowledge (TK), including oral, spiritual, and artisanal traditions. Legal redress is limited—communities must prove prior knowledge, often without written evidence, and enforcement remains weak due to poor coordination and technical gaps (Shanker and Prakash, 2013). Additionally, Indian courts have yet to establish strong jurisprudence, treating TK largely as a policy issue rather than a constitutional right under Articles 21 or 29.

4.3. International Legal Regimes and their Challenges

4.3.1. TRIPS Agreement

The TRIPS Agreement, under the WTO, sets global IP standards but overlooks Traditional Knowledge (TK). Although Article 27.3(b) permits exclusion of plants and animals from patents, it doesn't ensure protection or benefit-sharing for TK holders. This gap enables corporations—mainly from developed countries—to exploit indigenous knowledge without accountability

(Gervais, 2005).

India has pushed for mandatory disclosure of TK origin and prior informed consent in patent filings, but proposals face resistance from major economies like the US and EU, which argue such reforms may disrupt trade (WTO, 2021).

4.3.2. Convention on Biological Diversity (CBD) and Nagoya Protocol

The CBD (1992) and its Nagoya Protocol (2010) seek to balance the interests of biodiversity conservation, sustainable use, and equitable benefit-sharing. Article 8(j) of CBD urges the respect and preservation of TK. The Nagoya Protocol, ratified by India in 2012, elaborates the obligations for Access and Benefit Sharing (ABS).

However, compliance by many developed countries remains weak. Moreover, enforcement under CBD mechanisms relies on national legislation, which is inconsistent across jurisdictions, leading to regulatory arbitrage and legal uncertainty (UNEP, 2018).

4.3.3. WIPO Intergovernmental Committee (IGC) on Genetic Resources, TK and Folklore

The World Intellectual Property Organization (WIPO) has, since 2001, hosted negotiations under the Intergovernmental Committee (IGC) to develop a legally binding instrument to protect TK, genetic resources, and folklore. Despite over 40 sessions, there is still no consensus on definitions, scope, or enforcement mechanisms (WIPO, 2023).

The key deadlock lies in the North-South divide. Developing countries like India demand recognition of community rights and equitable benefit sharing, while developed countries seek flexible, voluntary norms. This impasse mirrors broader tensions in global trade and IP governance (Foster, 2016).

4.4. The Urgent Need for a Global Legal Consensus

India cannot safeguard Traditional Knowledge (TK) alone, as it is vulnerable to cross-border misuse in the digital era. A binding global framework under WIPO or a TRIPS amendment is essential. India must lead in global forums like BRICS, G77, and the Global South IP Caucus, and push for TK clauses in trade deals like RCEP and the India-EU FTA.

At home, India should support TK communities through legal empowerment, local documentation, and capacity building to ensure their voices are heard globally.

5. Judicial Trends and Case Law

The evolution of jurisprudence around traditional knowledge (TK) in India is still nascent, with relatively limited direct adjudication compared to other intellectual property (IP) domains. However, several landmark cases and legal developments — both domestic and international — have shaped the narrative around TK protection, especially in the areas of biopiracy, patent invalidation, and community rights.

- **The Turmeric Patent Case (India/US)**

One of the most landmark TK-related cases unfolded in the U.S., where a 1995 patent on turmeric's wound-healing properties—long used in Ayurveda—was challenged by India's CSIR. The USPTO revoked the patent in 1997 after CSIR presented traditional texts as prior art (Gupta, 2004). This victory led to the creation of the Traditional Knowledge Digital Library (TKDL), aimed at documenting TK to prevent biopiracy (Pushpangadan and Nair, 2005).

- **The Neem Patent Case (India/Europe)**

Another key global case involved a 1995 European patent on a neem-based pesticide, granted to WR Grace and the U.S. Department of Agriculture, despite its long use in India. The RFSTE and IFOAM challenged the patent, and in 2000, the EPO revoked it for lack of novelty, recognizing it was based on traditional knowledge (Shiva, 2001). The case underscored how global IP systems often fail to protect indigenous knowledge without mandatory origin disclosure or consent.

- **Divya Pharmacy v. Union of India (2018)**

In a landmark decision, the Uttarakhand High Court held that Indian companies must obtain prior informed consent (PIC) and share benefits when commercializing traditional knowledge (TK) and biological resources. Citing Section 21 of the Biological Diversity Act, 2002, the court directed Divya Pharmacy (Patanjali Ayurved) to comply with access and benefit-sharing norms (Divya Pharmacy v. Union of India, 2018). This was a pivotal judicial recognition that indigenous communities hold enforceable rights over their TK and must be respected by both domestic and foreign entities.

- **Rakesh Kumar v. State of Haryana (2020)**

In *Rakesh Kumar v. State of Haryana (2020)*, the Punjab and Haryana High Court addressed the unauthorized commercial use of traditional seeds, invoking the Protection of Plant Varieties and Farmers' Rights Act, 2001.

The court affirmed that farmers' traditional knowledge and cultivation methods are intellectual contributions deserving legal protection. Though dismissed on procedural grounds, the case reignited debate over the enforceability of farmers' rights vis-à-vis corporate seed claims.

- **Novartis AG v. Union of India (2013)**

Though not a TK case, *Novartis AG v. Union of India (2013)* was crucial in affirming India's IP stance. The Supreme Court denied a patent for an incremental form of Imatinib Mesylate, citing Section 3(d) of the Patents Act, which rejects patents lacking enhanced efficacy.

The judgment reinforced India's public interest-driven IP regime, prioritizing access to medicines and resisting monopolies—principles also central to TK protection.

5.1. Emerging Jurisprudence on Cultural and Spiritual Knowledge

Indian courts have not yet fully adjudicated disputes involving oral traditions, cultural rituals, or spiritual healing practices as TK. However, there is growing recognition in global jurisprudence. For instance, in Australia, the case of *Milpurrurru v. Indofurn Pty Ltd (1994)* recognized Aboriginal artists' rights over sacred motifs, suggesting that collective custodianship can be protected under existing IP law (Anderson, 2009).

Such examples may be persuasive for Indian courts as TK-related litigation becomes more frequent. The Indian judiciary is expected to increasingly draw on comparative international jurisprudence to guide decisions around spiritual and cultural TK.

5.2. Judicial Trends: An Analytical Synthesis

From these cases, key judicial trends emerge:

- **Judicial Caution:** Courts often defer to bodies like the National Biodiversity Authority rather than broad judicial rulings.

- **Community-Centric Rights:** Courts recognize benefit-sharing and community entitlements under laws like the BDA and PPVFR Act.
- **Sui Generis Alignment:** Judicial reasoning supports India's unique IP model, favoring traditional access over monopolies.
- **Call for Activism:** Scholars urge expanding Article 21, 29, and 48A to firmly embed TK within rights to culture, health, and livelihood (Chaturvedi, 2020).

Though still evolving, TK jurisprudence is expected to grow as indigenous awareness and commercial pressures increase.

6. Challenges in Implementation and Policy Gaps

Despite the constitutional vision, existing laws, and India's international obligations, the effective protection of traditional knowledge (TK) in India faces several legal, administrative, and socio-cultural challenges. These gaps not only hinder enforcement but also lead to continued exploitation, misappropriation, and under-compensation of communities who are the true custodians of such knowledge.

6.1. Lack of a Comprehensive Sui Generis Framework

One of the most critical gaps is the absence of a comprehensive sui generis legislative framework for the protection of TK. While various laws such as the Biological Diversity Act, 2002, Patents Act, 1970, and Geographical Indications of Goods Act, 1999 provide piecemeal protections, they do not constitute a unified legal approach to address the specific features of TK — such as its collective ownership, oral transmission, and non-commercial origin (Ghosh, 2012).

For example, while the Patents Act excludes traditional knowledge from patentability under Section 3(p), it does not actively protect TK or grant positive rights to its holders. Similarly, the BDA focuses largely on biological resources, often side-lining the cultural and knowledge systems associated with them.

6.2. Inadequate Community Participation and Awareness

A major challenge lies in the lack of awareness among indigenous and local communities about their rights under IPR laws. Many are unfamiliar with tools like Prior Informed Consent (PIC) and Access and Benefit Sharing (ABS), leading to a gap between legal provisions and ground realities (Sampat, 2010). Despite BDA's mandate for community involvement, poor outreach by State

Biodiversity Boards (SBBs) and inactive or under-equipped Biodiversity Management Committees (BMCs) hampers effective protection of traditional knowledge (NBA, 2019).

6.3. Weak Enforcement and Institutional Overlap

India's TK protection regime suffers from institutional fragmentation. Multiple agencies — the National Biodiversity Authority (NBA), Intellectual Property Appellate Board (IPAB) (now merged with High Courts), Controller General of Patents, Designs and Trademarks (CGPDTM), and Traditional Knowledge Digital Library (TKDL) — have overlapping responsibilities with limited coordination.

Enforcement actions such as revoking wrongful patents or initiating benefit-sharing proceedings are infrequent, slow, and inconsistent. The lack of clear guidelines for inter-agency cooperation means that disputes often fall into procedural delays or jurisdictional confusion (Menon and Ramesh, 2018).

6.4. Documentation Dilemmas and the Risk of Misappropriation

While initiatives like the TKDL have played a vital role in preventing patent piracy by documenting traditional medicinal knowledge, there are challenges associated with over-documentation and the loss of secrecy. Communities often view documentation with suspicion, fearing that it may make their sacred or ritual knowledge more vulnerable to theft or commodification (Basu, 2016).

Further, the focus on classical Ayurveda, Unani, and Siddha systems within the TKDL tends to marginalize tribal, folk, and orally-transmitted knowledge, which remains undocumented and unprotected. This uneven approach results in selective safeguarding, leaving large swaths of knowledge systems exposed to exploitation.

6.5. Lack of Legal Recognition for Oral and Unwritten Knowledge

Modern IP frameworks depend heavily on written, fixed expressions of knowledge, which contradicts the oral, performative, and evolving nature of most TK systems. India's legal system still does not offer explicit recognition or enforceable rights for oral traditions and practices unless they are transcribed or codified — a criterion that disproportionately harms tribal and rural communities (Dutfield, 2011).

This not only results in their exclusion from benefit-sharing frameworks but

also delegitimizes their cultural contributions in formal legal for a. Courts too often demand written evidence, which places indigenous claims at a disadvantage vis-à-vis corporations that possess technical documentation.

6.6. Inadequate Benefit Sharing and Commercial Equity

Although Section 21 of the BDA mandates equitable benefit sharing, actual implementation has been inconsistent. Studies have shown that companies often bypass ABS requirements or negotiate disproportionately small compensation amounts with community representatives lacking bargaining power or legal aid (Bhutani and Kohli, 2014).

The Divya Pharmacy case (2018) exemplifies how companies using Ayurvedic knowledge fail to comply with ABS norms unless judicially compelled. Even then, enforcement agencies struggle with capacity constraints and lack adequate databases to assess whether TK has been fairly commercialized.

6.7. Global Pressures and Trade Agreement Conflicts

India's commitment to international obligations under the TRIPS Agreement and Free Trade Agreements (FTAs) can at times conflict with its domestic goals of protecting traditional and cultural knowledge. Many FTAs, particularly with developed nations, include provisions for data exclusivity, patent linkage, and investor-state dispute settlement (ISDS) mechanisms that could undermine local policy space (Correa, 2002).

Attempts to introduce Disclosure of Origin (DoO) and benefit-sharing obligations into TRIPS negotiations have met stiff resistance from developed nations, who fear it could affect pharmaceutical and biotech interests. As a result, there exists a legal disconnect between the flexibilities permitted under TRIPS and India's attempts to implement community-centered IP policies (WIPO, 2015).

Challenge Area	Key Issues
Legal Gaps	No unified sui generis law for TK
Community Awareness	Low literacy and awareness among TK holders
Enforcement	Bureaucratic delays, weak judicial interventions
Documentation	Risk of overexposure, marginalization of folk knowledge
Oral Knowledge	No formal recognition unless codified
Benefit Sharing	Inadequate negotiations and monitoring mechanisms
International Pressures	TRIPS compliance limits domestic policy innovation

Image- Summary of Implementation Gaps

Source: Self Created

7. Future Pathways and Policy Recommendations

The growing urgency to protect traditional knowledge (TK) is not merely a matter of legal reform—it is a civilizational imperative. India, as the custodian of an unparalleled cultural and ecological heritage, must adopt proactive, inclusive, and rights-based strategies to secure its traditional wisdom from biopiracy, misappropriation, and cultural commodification. Building on the insights from legal lacunae and implementation gaps, this section offers comprehensive policy recommendations grounded in constitutional values, comparative jurisprudence, and global best practices.

7.1. Enacting a Sui Generis Legal Framework for TK Protection

Key Policy Recommendation:

- India urgently needs a dedicated sui generis TK law that goes beyond current IP structures and aligns with the CBD and Nagoya Protocol. Such legislation should:
- Recognize collective, intergenerational ownership of TK.
- Clearly define TK, folk knowledge, sacred knowledge, and bio-cultural expressions.
- Adopt a Tiered Protection Model based on secrecy, sacredness, or commercial use (WIPO, 2022).
- Enforce Disclosure of Origin (DoO) in patent filings involving TK.
- Mandate Prior Informed Consent (PIC) and benefit-sharing, with penalties for misuse.

Learn from models in Peru and Panama, which offer strong community-based protections (Ruiz, 2010).

7.2. Community Empowerment and Legal Literacy

Law must not only be made for the people but also be made accessible to them. Community empowerment should begin with capacity-building programs, especially among tribal, rural, and artisanal groups. Legal literacy campaigns—possibly under the Nyaya Bandhu scheme or Digital India Legal Awareness Initiative—should include:

- Awareness drives on intellectual property rights and biodiversity laws in local languages.
- Training on documentation, PIC processes, and benefit-sharing models.
- Setting up of Village Legal Knowledge Centers in collaboration with law schools under clinical legal education models (Bhat, 2014).
- Inclusion of indigenous elders and knowledge-holders in policy consultations, ethics boards, and academic peer review panels.

This participatory approach is essential for legitimacy, sustainability, and equity.

7.3. Strengthening the Traditional Knowledge Digital Library (TKDL)

While the TKDL has been key in blocking global patent misappropriation, it must evolve into a community-driven, decentralized knowledge commons. This means expanding coverage beyond classical systems to include oral, folk, and tribal knowledge, enabling secure community editing access, and collaborating with local informatics and anthropological projects. Verified community authentication mechanisms can help decentralize authority and promote co-ownership of digital heritage (Rai and Chandra, 2020).

7.4. Institutional Streamlining and Inter-Agency Coordination

India's fragmented TK governance can be improved by creating a National Traditional Knowledge Authority (NTKA), empowered by law and staffed with legal experts, anthropologists, scientists, and community representatives. The NTKA should coordinate between:

- The Ministry of AYUSH

- National Biodiversity Authority (NBA)
- Controller General of Patents, Designs & Trademarks (CGPDTM)
- Geographical Indications Registry
- Ministry of Tribal Affairs

The NTKA can serve as a single-window authority for TK registration, ABS implementation, and cross-border IPR disputes. Its mandate must include resolving benefit-sharing disputes, issuing community licenses, and vetting commercial contracts involving TK.

7.5. Codification and Protection of Oral Knowledge

To better protect oral and unwritten traditions, India should develop a codification system grounded in community consent and cultural secrecy. This could include ethnographic documentation, blockchain timestamping, non-disclosure cultural contracts, and “sacred commons” categories to prevent commercialization. India can also draw from UNESCO’s Intangible Cultural Heritage model to guide domestic efforts (UNESCO, 2003).

7.6. Judicial Sensitization and IP Tribunal Reforms

Judicial and quasi-judicial bodies should undergo continuous training on TK-related jurisprudence. Often, courts rely solely on conventional IP doctrines without understanding customary laws, oral evidence, and community traditions.

Specialized benches or IP tribunals should include cultural experts and indigenous representatives when dealing with cases involving TK or cultural misappropriation. The revival of the Intellectual Property Appellate Board (IPAB) or its merger with high courts should not compromise domain-specific expertise (Saha and Banerjee, 2021).

7.7. International Advocacy and Treaty Reform

India should take the lead in pushing for a binding international instrument on Traditional Knowledge (TK) within WIPO’s IGC-GRTKF. Key priorities in WTO and WIPO negotiations must include mandatory disclosure of origin, enforceable benefit-sharing, recognition of community authorship, and safeguards against misuse of cultural expressions. India’s positions in global forums like the G20, BRICS, and the Digital Public Goods Alliance should be strategically used to champion TK-friendly reforms..

7.8. Cultural and Educational Integration

Protection must be accompanied by celebration. India should integrate TK into national education curricula, museums, innovation hubs, and media. University syllabi, especially in law, public policy, medicine, and environmental studies, must include indigenous perspectives and community epistemologies.

Such efforts can help redefine the narrative from “protection against theft” to “recognition of wisdom”, shifting the discourse from defensive lawmaking to affirmative cultural sovereignty.

8. Conclusion

The legal protection of traditional knowledge (TK) is a critical challenge in modern IP law, especially for a culturally rich nation like India. TK, rooted in collective memory and nature-based practices, clashes with Western IPR systems that favor individual, market-driven innovations (Posey and Dutfield, 1996; Gervais, 2005).

India’s battles over turmeric, neem, and basmati underscore the vulnerability of undocumented TK and the inadequacies of global patent norms (Shiva, 2007). Initiatives like the TKDL have helped resist biopiracy, but without strong legislation and global treaty reforms, defensive efforts remain limited (Rai and Chandra, 2020).

There is a growing need for a *sui generis* legal framework that recognizes community authorship, ensures benefit sharing, and aligns with constitutional ideals of justice and cultural rights (Bhat, 2014). Law must evolve from being just a shield to also becoming a platform for cultural affirmation, innovation, and dignity.

In essence, protecting TK is not only about legal sovereignty—it is about honoring intergenerational wisdom and securing the rights of those who have long been its guardians.

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CHAPTER - 16

YOGA: A HOLISTIC JOURNEY THROUGH TIME AND WELLNESS

SAYANTANI DAS

State Aides College Teacher-I Haringhata Mahavidyalaya University
of Kalyani, Email: sayantani.socio@gmail.com

1. Introduction

What comes to mind when you hear the word “Yoga”? Perhaps stretches, physical exercises, or a flexible body? While these are common associations, yoga encompasses far more. It is a profound discipline that extends beyond physical flexibility, offering extensive benefits for both physical and mental well-being. Yoga, once a spiritual discipline rooted in ancient Indian philosophy, has undergone a significant transformation to emerge as a popular form of modern-day exercise. Rooted in ancient tradition, yoga has evolved over centuries into a holistic practice aimed at achieving harmony between the body, mind, and soul. More than just a form of exercise, yoga serves as a spiritual path that purifies the mind of stress and negativity while promoting physical vitality and inner peace. In today’s fast-paced and stress-laden world, yoga also emerges as a vital tool for mental health, reducing stress, anxiety, and depression, while enhancing emotional resilience and cognitive function. Emphasizing physical postures and breath control, modern yoga styles such as

Vinyasa, Power Yoga, and Hot Yoga offer a low-impact, accessible alternative to traditional workouts while retaining elements of mindfulness and holistic health.

Yoga, derived from the *Sanskrit* root "*yuj*," meaning to *yoke or unite*, embodies the union of mind, body, and spirit. Traditionally a spiritual discipline, yoga has gained prominence worldwide as a therapeutic and fitness practice. The evolution of yoga from its ancient origins to its modern interpretations showcases its adaptability and enduring relevance.

It works on leading to the union of your consciousness to the universal consciousness. The person who experiences this unity and bond between nature and himself is said to have attained moksha (ultimate liberation).

Yoga aims to achieve self-actualization and peace, even when faced with the most difficult tasks. That is when you truly achieve kaivalya (freedom). It imparts basic human values and pushes human beings towards a sustainable lifestyle filled with joy, peace and gratitude.

There is Yogic lore that says Yoga has been as old as the dawn of civilization. In this lore, Lord Shiva is said to be the first Yogi or Adiyogi. Passed down through generations, this story talks of a time when Lord Shiva imparted and taught Yoga to seven of his disciples. These seven disciples went in different directions to spread the knowledge of Yoga far and wide. Their knowledge reached areas like Asia, the Middle East, Northern Africa and South America.

This paper aims to explore the historical development of yoga, its diverse benefits, and its potential to promote holistic health. It traces yoga's evolution from its classical roots to its present significance within contemporary fitness culture. The discussion emphasizes how yoga integrates physical fitness with mental well-being, positioning it as a vital component of modern wellness practices. By engaging with both traditional texts and current research, the paper underscores yoga's distinctive role at the crossroads of exercise, health, and inner balance in the 21st century.

2.Yoga Through The Ages :Ancient History of Yoga

The origins of yoga can be traced back over 5,000 years to the Indus Valley Civilization, where archaeological evidence suggests the practice of yoga-like postures. The earliest written records of yoga appear in the Rig Veda, one of

the four Vedas composed around 1500 BCE. However, it was in the Upanishads and later the Bhagavad Gita that the philosophical foundations of yoga were more explicitly developed.

The classical period of yoga is marked by Patanjali's Yoga Sutras, composed around 200 BCE, which codified the practice into an eight-limbed path known as Ashtanga Yoga. These limbs include ethical precepts (yamas and niyamas), physical postures (asanas), breath control (pranayama), sensory withdrawal (pratyahara), concentration (dharana), meditation (dhyana), and absorption (samadhi).

Other significant texts, such as the Hatha Yoga Pradipika and the Gheranda Samhita, emerged in the medieval period, emphasizing physical purification and the development of the body as a vehicle for spiritual enlightenment.

However, there is no proper evidence of when this discipline started. It is believed that it originated in Northern India, approximately 5000 years ago.

1. Pre-Vedic Period (Before 3000 BC)

Western scholars believed that yoga originated around 500 BC, the period when Buddhism came into existence. However, depictions of yoga postures were found in the recent excavations at Harappa and Mohenjodaro. This indicates that yoga may have been practiced as early as 5000 years ago. However, there are no written records to prove this conclusively.

Dating back to 2700 BC, in the Indus-Saraswati valley civilization, seals and fossils have been found with people doing Yoga Sadhana. This hinted at the practice of Yoga starting at such early times, although it was an undocumented period.

2. Vedic Period (3000 BC to 800 BC)

The word 'Yoga' was first mentioned in the ancient Sanskrit texts of Rig Veda which dates back to 1500 BC. This old text mainly spoke of rituals, mantras and songs that the Vedic priests used in their life.

Later, in the Atharva Veda (around 900 BC), the importance of controlling breath was stressed upon. However, it is difficult to pinpoint the exact era as the Vedas were originally passed down through stories and by word-of-mouth.

Vedic priests avoided self-indulgences and performed sacrifices called yajnas. They used poses that researchers believed have now evolved into modern Yoga postures. During the vedic period, yoga was practiced ritually, to develop concentration, and to transcend the mundane. The rituals practiced during this period are quite differing from the present practices of yoga. The rituals of the vedic period are close to the definition of yoga: union of the individual self with the supreme self.

3. Pre-Classical (Upanishad) Period (800 BC to 250 BC)

This 2,000 year period in the history of Yoga is predominated by the Upanishads. They explain the meanings of Vedic literature, reading between the lines and explaining how the body and mind works. Moreover, it talks of spiritual teachings

Out of the 108 written documents, 20 of them were Yoga Upanishads. They focus on different yogic techniques that are still used, like pranayama (breathing exercises), pratyahara (withdrawing senses), breathing modulation, sound and meditation in complete peace. At this time period, Yoga was divided into two forms - karma Yoga and jnana Yoga.

4. Classical Period (184 BC to 148 BC)

The classical period of Yoga lasted from 500 BC TO 800 AD. The importance of a peaceful mind, as a consequence of Yoga, was put into the limelight during this period.

It was in this period that Yoga seeped its way into Buddhism and Jainism. Lord Buddha was known to be the first Buddhist to study Yoga. Buddhist literature laid emphasis on meditation and yogic poses that helped attain enlightenment. Jainism imbibed Yoga, too, with the help of Lord Mahavira. He stressed on the importance of meditation to attain salvation and moksha.

The Bhagavad Gita, a 700-verse compilation of conversation between Lord Krishna and Prince Arjuna, explains the importance of dharma, jnana Yoga, karma Yoga and bhakti Yoga. In this renowned text, Lord Krishna says, “Samatvam Yoga uchyate”, i.e. Yoga is a balanced state. Yoga strives for oneness between man and nature. It takes us back to our joyous state.

Maharshi Patanjali, the Father of Yoga, was the first yogi to truly understand and explain the meaning of Yoga and the true purpose behind it, in his Yoga

Sutras. This was called Raja Yoga.

The first commentary on the Yoga Sutras by Veda Vyasa was written in the classical period. The deep-rooted relationship between the philosophy of Yoga and Samkhya philosophy (one of the six Indian philosophies) was unearthed and talked about. Nata dances and martial arts used the techniques written in the Yoga Sutras, to help accentuate their dance and martial forms, respectively. The classical period focused on the importance of mindfulness in yoga. Yoga seemed to flourish in this period.

5. *Post-Classical Period (800 AD to 1700 AD)*

The post-classical period ran up to 1700 AD. It brought forward names of numerous Yoga teachers who worked towards the development of this beautiful, cultural art form. Some of the yogis include Acharya Trayas-Adi Shankaracharya, Madhvacharya, Ramanujacharya, Meera Bai and Purandara Dasa. Adi Shankaracharya devoted his time to the continuation of jnana Yoga and Raja Yoga. He dedicated a large part of his life to developments and tweaks in the yogic cultures. Meditation was also stressed upon to clear the mind of negative thoughts. Other yogis like Tulsidas and Purandara Dasa worked on the science of Yoga. The Yoga of physical postures and breathing techniques or Hatha Yoga was popularized and is still widely renowned today.

6. *Modern Period (From 1863 AD onwards).*

Swami Vivekananda was one of the primary yogis to spread Yoga in the modern period that is from 1700 AD upto now. The period focused on Yoga as a manner of being physically strong. Ramana Maharshi, Ramakrishna Paramahansa, BKS Iyengar, K Pattabhi Jois, Paramhansa Yogananda, and Vivekananda held parts in the spread and popularity of Hatha Yoga, Vedanta Yoga and Bhakti Yoga.

Yoga has undergone a wide number of changes over the centuries. Over this span of time, many people have been propounding numerous theories for the spread of its culture. But even as it walks into the 21st century, the essence and soul of Yoga lies with the feeling of oneness with the spirit, mind, body and nature.

3. *Modern Day Representation of Yoga.*

Today, yoga is practiced in a variety of forms, including Hatha, Vinyasa, Ashtanga, Bikram, and Kundalini yoga. It has been integrated into fitness

regimes, therapeutic programs, and even corporate wellness initiatives. Modern yoga often emphasizes physical health, stress reduction, and mindfulness, sometimes detaching from its spiritual roots.

Benefits of Yoga:

Yoga offers a wide range of physical, mental, and emotional benefits:

1. **Physical Health:** Improves flexibility, strength, balance, and cardiovascular health. Helps manage chronic conditions such as arthritis, hypertension, and diabetes.
2. **Mental Health:** Reduces symptoms of anxiety, depression, and PTSD. Enhances mood and emotional regulation.
3. **Cognitive Function:** Improves concentration, memory, and cognitive flexibility.
4. **Sleep Quality:** Promotes relaxation and improves sleep patterns.

4. Yoga as Health

Yoga supports preventive health by promoting a balanced lifestyle. It helps maintain body weight, improves digestion, boosts immunity, and enhances overall vitality. As a low-impact exercise, yoga is accessible to individuals of all ages and physical abilities. Clinical studies have shown its effectiveness in managing chronic pain, cardiovascular diseases, and metabolic disorders.

Yoga has become an integral component of the modern fitness landscape, embraced by individuals across all ages, body types, and fitness levels. Unlike high-intensity training methods, yoga offers a low-impact yet highly effective form of exercise that improves strength, flexibility, balance, endurance, and posture. Contemporary fitness-oriented styles such as Power Yoga, Vinyasa Flow, and Hot Yoga combine traditional asanas with cardiovascular and aerobic elements, creating full-body workouts that enhance muscle tone and stamina while reducing the risk of injury. Comparative studies suggest that consistent yoga practice can yield strength and flexibility gains similar to those achieved through resistance training and pilates, while also improving cardiovascular efficiency and respiratory capacity (Miao et al., 2023).

Beyond musculoskeletal benefits, yoga has been shown to aid in weight management, regulate metabolism, and lower risk factors associated with chronic diseases such as obesity, type 2 diabetes, and hypertension. Several randomized controlled trials have demonstrated significant reductions in body mass index (BMI), cholesterol levels, and blood pressure among regular

practitioners, positioning yoga as both a preventive and therapeutic exercise intervention¹. Additionally, yoga's focus on controlled breathing (pranayama) and relaxation techniques supports improved lung function, stress reduction, and better sleep quality (National Center for Biotechnology Information, 2011).

One of the most distinctive aspects of yoga compared to conventional workouts is its holistic integration of physical conditioning with mental and emotional well-being. Practices that combine movement with mindfulness are now recognized as effective tools for reducing cortisol levels, alleviating anxiety, and enhancing resilience—outcomes that high-intensity workouts often neglect. As a result, yoga appeals not only to fitness enthusiasts but also to individuals seeking rehabilitation, stress relief, and sustainable wellness practices.

The accessibility and versatility of yoga further account for its global popularity. With minimal equipment required, it can be practiced at home, in studios, at workplaces, or through digital platforms. The rise of online yoga classes, mobile fitness apps, and virtual communities has expanded its reach, making yoga one of the most practiced forms of exercise worldwide. Today, more than 300 million people across the globe engage in yoga, and the global yoga industry is valued at over \$80 billion annually, reflecting its mainstream acceptance as both a fitness and wellness practice. International initiatives such as the United Nations' International Day of Yoga have further reinforced its cultural and global significance.

By bridging the gap between physical fitness, preventive healthcare, and mental well-being, yoga redefines what it means to exercise in the 21st century. It is no longer perceived merely as a supplementary activity but as a comprehensive lifestyle practice that aligns ancient wisdom with the demands of modern health and fitness culture.

Yoga is also increasingly recognized in sports science and athletic training. Elite athletes and professional sports teams incorporate yoga into their conditioning programs for injury prevention, joint stability, core strengthening, and recovery. Unlike weight training, which may shorten muscle fibers, yoga elongates and strengthens them simultaneously, leading to improved range of motion and reduced stiffness. This makes yoga particularly beneficial for sports requiring agility and flexibility, such as dance, gymnastics, swimming, and martial arts.

From a rehabilitation perspective, yoga functions as a form of therapeutic exercise for individuals recovering from injuries or managing chronic pain. Gentle yoga routines have been shown to aid in conditions such as arthritis, lower back pain, and postural imbalances. Clinical studies highlight yoga's effectiveness in reducing musculoskeletal discomfort, improving spinal alignment, and increasing mobility among aging populations. As such, yoga is now prescribed by physiotherapists and rehabilitation specialists as a complement to conventional therapy.

Another unique strength of yoga as an exercise lies in its ability to address both sympathetic and parasympathetic nervous system regulation. While most high-intensity exercises primarily activate the sympathetic “fight or flight” response, yoga, through breath regulation (pranayama) and meditation, enhances parasympathetic activation. This contributes to lower resting heart rates, improved heart rate variability (HRV), and faster post-exercise recovery. In this way, yoga balances physical exertion with physiological restoration, an element often missing in modern fitness regimens.

On a population scale, yoga contributes to public health and preventive medicine. Unlike gym-based training, yoga requires minimal equipment and space, making it cost-effective and accessible to communities worldwide. Its adaptability across age groups—from children in schools to elderly populations in senior centers—has positioned yoga as one of the most inclusive and sustainable exercise options available today. Research indicates that community yoga programs not only improve physical health markers but also encourage social connection, reducing isolation and fostering collective well-being.

With over 300 million practitioners worldwide and a rapidly growing industry, yoga has secured its place as more than a cultural tradition—it is now a cornerstone of modern exercise science. Its ability to provide strength, endurance, flexibility, balance, cardiovascular conditioning, rehabilitation, and stress reduction in a single discipline distinguishes it from most conventional workouts. In a fitness culture often dominated by intensity and competition, yoga offers a sustainable, holistic, and adaptable exercise model that aligns with both personal wellness goals and global health needs.

5. Yoga as Mental Health

Yoga's meditative practices, including pranayama and dhyana, foster mental

clarity and emotional resilience. Regular practice has been linked to reduced cortisol levels, improved autonomic nervous system balance, and enhanced neuroplasticity. Yoga is increasingly used as a complementary therapy in mental health treatment for conditions such as anxiety, depression, and trauma.

In today's fast-paced world marked by digital distractions and emotional burnout, yoga offers an accessible and holistic approach to achieving mental equilibrium.

Numerous studies support yoga's role in reducing stress, anxiety, and depression. It promotes self-awareness, emotional regulation, and inner calm. Increasingly, yoga is being incorporated into mental health care as a complementary intervention, used alongside psychotherapy and medication to support recovery and resilience. Whether practiced in solitude or in group settings, yoga cultivates mindfulness, fosters compassion, and empowers individuals to take charge of their mental wellness.

Yoga and Mental Health:

Yoga contributes to mental well-being through multiple pathways. First, it powerfully reduces stress and anxiety. The breathing exercises and meditation in yoga stimulate the parasympathetic ("rest- and-digest") nervous system, counteracting stress hormones (National Center for Complementary and Integrative Health, 2021). For example, regular yoga practice elevates levels of GABA – a neurotransmitter linked to calming the mind – which is associated with better mood and lower anxiety (Streeter et al., 2007). Likewise, yoga's meditation lowers activity in the limbic (emotional) centers of the brain, leading to a "more tempered response" to stress (Davidson & McEwen, 2012). Contemporary sources note that by guiding the breath and attention, yoga "calms and centers the mind" and thus naturally relieves tension (Harvard Health Publishing, 2018). In practice, yoga has become "increasingly popular for stress management," with studies showing that consistent practice is linked to lower cortisol and a more relaxed nervous system (National Institutes of Health, 2019). In short, yoga is widely used as a stress-relief tool that quiets the mind and soothes anxious feelings.

Beyond stress relief, yoga enhances emotional regulation and resilience. It strengthens communication between brain regions (prefrontal cortex and amygdala) that control emotions, supporting more balanced responses (Hölzel et al., 2011). In practical terms, yoga's mindfulness components teach

practitioners to observe their thoughts and feelings without immediate reactivity. Empirical studies support this: for instance, adolescents who practiced yoga showed significantly better emotional regulation and higher self-esteem than non-practitioners (Noggle et al., 2012).

More recently, a controlled trial in college students found that a yoga-based meditation intervention “significantly reduced anxiety, depression, and perceived stress while enhancing emotional regulation and self-awareness” (Seshadri & Shankar, 2021). In other words, yoga practice can help people notice negative thoughts but detach from them, steadily improving mood control. Over time this leads to greater resilience – a steadier mind in the face of challenges.

These mental-health effects translate into improvements in anxiety and depression. Numerous studies have found yoga helps mitigate mood disorders. For example, a 2023 meta-analysis of randomized trials found that mindfulness-oriented yoga significantly alleviates depressive symptoms in people with major depression (Miao et al., 2023). Likewise, another systematic review showed yoga interventions outperform control groups in reducing anxiety symptoms in adults, and also yielded reductions in depression measures among those with depressive disorders (Martínez- Calderon et al., 2023). These findings align with clinical observations: yoga’s combination of gentle exercise, breath awareness, and relaxation often elevates mood and energy. One broad review notes yoga practice “reduces stress, anxiety, depression, and chronic pain” while improving sleep and overall quality of life (National Center for Biotechnology Information, 2011). Thus, a growing body of evidence suggests that yoga is an effective complementary strategy for managing anxiety and depressive symptoms, often alongside conventional treatment.

Scientific Evidence

The benefits of yoga for mental health are supported by a substantial research literature. Multiple meta-analyses and clinical trials have confirmed positive outcomes. As noted, Miao et al. (2023) reported moderate effect sizes for yoga’s improvement of depression in major depressive disorder, and they observed similar anxiety reductions in those trials. Martínez-Calderon et al. (2023) similarly found that yoga-based programs significantly reduced anxiety symptoms and (with some caveats) depression in clinical populations. On the whole, reviews conclude that across diverse groups and conditions, yoga practice tends to lower levels of stress and mood symptoms. For example, a

comprehensive 2011 review summarized many studies, noting that “yogic practices... reduce stress, anxiety, and depression” and enhance sleep and well-being (National Center for Biotechnology Information, 2011). A more recent summary echoed this, stating that existing meta- analyses and high-quality trials indicate yoga has “beneficial effects...for...mental health,” while calling for larger trials to confirm these findings (Cramer et al., 2017). Interestingly, recent research also highlights how yoga matters: one 2023 study found that higher “yoga involvement” – meaning deeper engagement with yoga philosophy and practice – predicted better psychological well-being (Park et al., 2023). In short, the scientific consensus is that yoga has measurable mental health benefits. While researchers note that more rigorous trials are needed, the cumulative evidence positions yoga as a credible, evidence-backed adjunct to support mental wellness.

6. Practical Applications of Yoga for Mental Balance

Individuals can incorporate yoga in simple and accessible ways to support mental balance. Experts emphasize that practice need not be lengthy; even a few minutes of daily yoga can improve mental clarity, emotional balance, and physical health (Harvard Health Publishing, 2018). Beginners are often encouraged to start with gentle, restorative poses and breathing exercises. For instance,

Child’s Pose (Balasana) is commonly recommended to calm the mind, as it promotes inward focus and relaxation through steady, deep breathing. Similarly, Legs-Up-the-Wall Pose (Viparita Karani), a simple inversion, is known to provide deep relaxation and soothe physical and mental tension (National Center for Complementary and Integrative Health, 2021).

A yoga session often concludes with Corpse Pose (Savasana), in which practitioners lie quietly and focus on the breath, allowing residual stress to dissolve as they are guided to “calm the mind and let go of tension” (National Institutes of Health, 2019). These asanas may be paired with pranayama (slow diaphragmatic breathing) or guided meditation to amplify their effect on stress reduction and relaxation. Many health resources highlight that yoga combined with breathwork are “wonderful ways to reduce stress... and enhance overall well-being” (National Center for Biotechnology Information, 2011).

In practice, individuals can access yoga through short online sessions, mobile applications, or beginner-friendly Hatha yoga classes. Over time,

consistent practice builds a steady routine in which regularly turning inward on the mat strengthens coping skills and enhances emotional balance (Cramer et al., 2017). The key lies in consistency and finding a safe, comfortable approach—because even brief daily sessions, when practiced regularly, can cumulatively foster greater mental resilience.

7. Future Prospects of Yoga.

As global health systems increasingly emphasize integrative and holistic approaches, yoga is expected to play a transformative role in promoting overall well-being. The World Health Organization (WHO, 2020) and various public health agencies have acknowledged yoga as a complementary practice in preventive healthcare and mental health management, positioning it as part of global wellness strategies. Many governments, including India's Ministry of AYUSH, have been actively promoting yoga through policy frameworks, international collaborations, and initiatives such as the International Day of Yoga, which highlights its growing worldwide acceptance (Ministry of AYUSH, 2021).

Physical Health Prospects.

In the future, yoga is likely to be increasingly prescribed as a non-pharmacological intervention for chronic lifestyle-related illnesses such as hypertension, diabetes, obesity, arthritis, and cardiovascular diseases. Studies suggest that regular yoga practice improves cardiovascular endurance, muscular flexibility, balance, and bone health, making it a sustainable form of exercise for all age groups (Cramer et al., 2019). In rehabilitation medicine, yoga is already being integrated for recovery in patients with neurological conditions, post-surgery healing, and even as a supportive therapy in cancer care (Lin et al., 2020). Its adaptability—from gentle restorative practices for seniors to dynamic power yoga for fitness enthusiasts—positions yoga as a versatile solution to physical health needs in modern societies.

Mental Health Prospects.

On the mental health front, yoga will continue to grow as a therapeutic modality for stress, anxiety, and depression. Research in neuroscience is uncovering how yoga positively influences brain regions associated with emotional regulation, memory, and attention (Gothe et al., 2019). Emerging evidence also shows yoga's potential in addressing trauma, post-traumatic stress disorder (PTSD), and addiction recovery (Van der Kolk, 2015). Mindfulness-oriented practices within yoga (such as pranayama and meditation) are gaining

popularity in clinical psychology and psychiatry as adjuncts to cognitive-behavioral therapy (de Manincor et al., 2016). In the coming years, yoga could become a mainstream part of mental health interventions, complementing traditional therapy and medication.

Technology and Accessibility.

Technological advancements are further accelerating yoga's reach. Digital platforms, mobile applications, and virtual reality-based programs are enabling personalized yoga experiences, making practice accessible across age groups and regions. Artificial intelligence and wearable health trackers are increasingly being used to monitor posture, breathing patterns, and heart rate during yoga practice, blending ancient traditions with modern innovation (Dangi et al., 2022). These developments ensure that yoga is not confined to studios but can be integrated into everyday lifestyles, whether at home, workplaces, or schools.

Balancing Tradition and Modern Science.

Looking ahead, the future of yoga rests in harmonizing traditional philosophical wisdom with modern scientific inquiry. This balance can ensure cultural sensitivity while preserving the depth of yoga's spiritual heritage, preventing over-commercialization, and expanding its therapeutic potential. Continued collaboration among policymakers, healthcare professionals, researchers, and yoga practitioners will be critical to safeguarding authenticity and maximizing yoga's role as a sustainable, inclusive tool for global health and human flourishing in the 21st century.

On the conclusive note we can say that Yoga's journey from ancient spiritual discipline to a modern wellness practice illustrates its profound versatility and relevance. With its myriad physical and psychological benefits, yoga offers a holistic approach to health and well-being. As we navigate contemporary health challenges, embracing yoga's comprehensive framework can lead to more balanced and fulfilling lives. The fusion of ancient tradition with modern innovation heralds a promising future for yoga as a cornerstone of global health and wellness.

Yoga, with its ancient roots and modern adaptations, has emerged as one of the most holistic forms of exercise and wellness practice available today. Unlike conventional fitness routines that often focus solely on physical conditioning, yoga integrates strength, flexibility, endurance, and balance with mindfulness, breath control, and emotional resilience. Contemporary research highlights its

effectiveness in improving cardiovascular health, musculoskeletal strength, and metabolic regulation while also addressing mental health concerns such as stress, anxiety, and depression. Its versatility—ranging from intense fitness styles like Power Yoga to restorative practices for rehabilitation—makes it suitable for diverse populations across different age groups and health conditions. I personally have been practicing yoga for over 12 years. I've started for the problem of PCOD and Spondylitis. Doctors have suggested me heavy medication and operation on my shoulder for the spondylitis pain. Refusing to have high dosage of steroids for the PCOD I've started practicing yoga, since then I've never got complaints about it, without a single dosage of pill. Those who practice yoga will whole heartedly say that there is a Yoga posture for almost all kind of physical or mental problem. Yoga has become an alternative medication for physical and mental ailments.

In the context of today's fast-paced world, yoga stands out as more than just a workout: it is a sustainable lifestyle practice that bridges the gap between physical exercise and inner well-being. Its global popularity, accessibility, and recognition by institutions such as the United Nations underscore its relevance in addressing both individual and collective health challenges. As yoga continues to evolve, its unique ability to harmonize body, mind, and spirit positions it not only as a tool for fitness but also as a pathway to holistic health in the 21st century.

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CHAPTER – 17

ENHANCING ACCESS TO JUSTICE IN THE DIGITAL AGE: THE ROLE OF E-COURTS AND DIGITAL JUSTICE SYSTEMS

ANTARA NEOGI
Student, Brainware University

ANANYA GHOSH
Student, Brainware University

AHANA DUTTA
Student, Brainware University

1.Introduction

Access to justice in India has long been constrained by systemic bottlenecks, including chronic case backlogs, procedural complexity, infrastructural limitations, and socio-economic barriers. According to recent estimates, over 5 crore cases remain pending in Indian courts, with approximately 90 per cent of that backlog lodged in trial courts where delays are most acute. Such chronic delay undermines citizen confidence in the rule of law and raises critical questions about the meaningful enforcement of fundamental rights, particularly

under Articles 14 and 21 of the Constitution, which guarantee equality before law and the right to life and personal liberty.

In response, the judiciary and executive have increasingly turned to digital innovations to improve judicial efficiency and broaden access. The e-Courts Mission Mode Project, launched under India's National e-Governance Plan, has evolved substantially since 2007, incorporating technologies such as online filing, virtual hearings, and data analytics. The COVID-19 pandemic acted as a catalyst for accelerating the adoption of remote judicial processes, with virtual courts becoming mainstream across several jurisdictions. Yet, debates persist regarding whether digital justice mechanisms genuinely *expand access* or inadvertently create new barriers for those without technological access or literacy.

This paper examines recent developments in digital justice systems in India, situating them within constitutional mandates, statutory frameworks, and judicial pronouncements. It evaluates empirical outcomes, highlights ongoing challenges, and assesses future directions for integrating advanced technologies such as artificial intelligence (AI) while safeguarding core tenets of procedural fairness and equality.

2. Conceptual Framework: Access to Justice and Digital Justice

Access to justice is not limited to formal court access; it encompasses affordability, procedural simplicity, timeliness of remedies, and societal inclusiveness. Indian jurisprudence has interpreted this concept expansively. For example, the Supreme Court in *Hussainara Khatoon v. State of Bihar* held that timely justice is an intrinsic element of Article 21's guarantee of liberty.¹

Digital justice refers to the integration of ICTs into judicial mechanisms to streamline adjudication, reduce transactional costs, enable remote participation, and promote transparency. It includes e-filing, e-service of process, virtual hearings, electronic evidence management, digital case repositories, and analytic tools for case prioritisation.

While digital systems hold transformative potential, their equitable impact depends on addressing the digital divide—unequal access to devices, reliable internet, and digital literacy—which disproportionately affects rural, economically disadvantaged, and vulnerable populations.

3. Evolution of E-Courts in India

1 The E-Courts Project and Its Phases

The e-Courts Mission Mode Project has been implemented in phases since 2007 by the Department of Justice, Ministry of Law and Justice, in collaboration with the Supreme Court e-Committee. Its rolling phases represent incremental shifts from basic computerisation to comprehensive digital ecosystems. Phase I (2010–2015) focused on basic ICT infrastructure in courts and network connectivity. Phase-II (2015–2023) enhanced service delivery through improved case management systems, video conference facilities, and platforms like the e-Courts Services App.

Most recently, Phase-III of the e-Courts Project (2023–2027) has been approved with an estimated outlay of Rs 7,210 crore, making it by far the most ambitious stage yet, and earmarked for creating digital, online, and paperless courts with smart systems for data-driven decision-making. The government released in the Union Budget 2025 also allocated significant funding to this initiative to ensure momentum in implementation.

Key components of Phase III include:

- Digitisation of the entire court record, including legacy records and pending case files.
- Universalisation of e-Filing and e-Payment across all court complexes and expansion of e-Sewa Kendras to assist litigants lacking direct digital access.
- Cloud-based data repositories for secure storage and easy retrieval.
- AI-enabled tools for case prioritisation, analytics, forecasting pendency trends, and aiding judicial registries.

Collectively, these measures aim to unify disparate digital platforms into a seamless, paperless interface connecting litigants, lawyers, courts, registries, and other stakeholders. Enhancements such as mobile applications and chatbots have been independently introduced by High Courts—for example, the Calcutta High Court launched an AI-powered chatbot and an e-bail bond system to assist litigants and improve procedural efficiency.

2. Pandemic-Driven Acceleration and Virtual Courts

The COVID-19 pandemic forced courts nationwide to adopt virtual

hearings to maintain the continuity of justice delivery. Post-pandemic institutionalisation of virtual courts expanded digital adjudication beyond emergency responses. As of late 2024–25, 29 virtual courts were operational, processing over 8.9 crore challans and generating significant online revenue from fines. Virtual platforms now handle large volumes of traffic offence adjudication, demonstrating scalability and efficiency.

4. Constitutional and Statutory Basis of Digital Courts

The constitutional mandate for ensuring access to justice flows from Articles 14 and 21 together with judicial interpretations emphasising substantive equality and due process. Digital courts cannot function in isolation; their legitimacy derives from statutory scaffolding and judicial recognition.

The Information Technology Act, 2000, provides legal recognition for electronic records and digital signatures, forming the statutory foundation for paperless judicial processes. Procedural codes, such as the Code of Civil Procedure, 1908 and Bharatiya Nagarik Suraksha Sanhita, 2023, provide frameworks that courts have interpreted to accommodate electronic processes, including e-summons and electronic service of notices. For example, the Uttarakhand High Court recently ordered the adoption of e-summons in cheque bounce cases under the Negotiable Instruments Act, requiring digital contact details of the accused for service and integrating e-payment links for fines, thereby streamlining criminal adjudication processes.

Emerging procedural rules that recognise electronic process must also cohere with safeguards for fairness, notice, and the right to be heard, maintaining constitutional legitimacy.

5. Judicial Response to Digital Justice

Indian courts have consistently affirmed the permissibility and utility of digital technology in judicial processes while emphasising procedural fairness. For instance:

- In *State of Maharashtra v. Praful Desai*, the Supreme Court upheld the validity of recording evidence through video conferencing, provided it does not compromise fairness.³
- *Swapnil Tripathi v. Supreme Court of India* recognised live-streaming and digital access as integral to the principle of open justice.⁴
- More recent judicial encouragement has come from senior judges

urging legal professionals to embrace digital competency as essential for future litigation and judicial engagement.

These judicial pronouncements reflect an evolving jurisprudence that views digital interventions not as ad-hoc accommodations but as integral to the modern justice delivery framework.

6. Impact of Digital Justice on Access to Justice

1. Positive Outcomes

Digital justice initiatives have produced measurable gains:

- **Cost reduction:** E-filing and e-payment systems allow stakeholders to engage with courts without travel and physical document costs.
- **Enhanced transparency and data access:** Platforms such as the National Judicial Data Grid (NJDG) democratize access to judicial data, enabling real-time insights into pendency and disposal across courts.
- **Expanded remote participation:** Virtual courts and digital processes have expanded access for litigants in remote or underserved regions.

Capacity building under Phase-III has included training initiatives, with over 910 programmes reaching more than 3.22 lakh stakeholders, ensuring that judges, court staff, and technologists are better equipped for digital court operations.

2. Challenges and Limitations

Despite these advances, significant challenges remain:

- **Digital divide:** Unequal digital access—particularly in rural areas—can exclude vulnerable groups from meaningful participation in digital justice systems.
- **Technical barriers:** Users report issues with platforms such as e-filing portals, where persistent system errors and a lack of offline alternatives impede access.
- **Infrastructure gaps:** While connectivity has improved, courts often face bandwidth and hardware constraints, especially in remote locations.
- **Cybersecurity and privacy concerns:** Digitisation raises data protection risks, which require robust legal frameworks to secure

sensitive judicial information.

Moreover, digital systems cannot mechanically resolve deep-rooted procedural culture issues such as frequent adjournments and understaffing, underscoring that technology is a tool, not a panacea.

7. Online Dispute Resolution and Arbitration

Beyond formal courts, India has actively encouraged Online Dispute Resolution (ODR) and digital arbitration mechanisms, particularly for commercial disputes. ODR platforms provide a cost-effective, time-efficient alternative to traditional litigation, supported by institutional arbitration centres that integrate digital processes for filing, mediation, and awards.

However, challenges persist regarding regulatory clarity on the enforceability of ODR outcomes and integration with existing legal frameworks. As digital arbitration expands, clear procedural safeguards and enforceability norms remain essential to its legitimacy.

8. Comparative and International Perspectives

Globally, advanced digital justice systems provide instructive benchmarks. Singapore's e-litigation ecosystem and Estonia's fully integrated digital judiciary illustrate how seamless legal e-services can function when infrastructure, public access, and legal frameworks align effectively. However, direct transplantation of such models without adaptation to India's demographic and socio-economic diversity may inadvertently perpetuate inequalities. Comparative analysis underscores the need for contextual adaptation and incremental scaling, rather than wholesale adoption of foreign systems.

9. Emerging Technologies and the Future of Digital Justice

Emerging technologies such as AI, machine learning, and cloud computing are increasingly featured in digital justice discourses. Researchers propose frameworks for automated case prioritisation and analytic tools that aid judicial decision-making, though with careful guardrails to prevent algorithmic bias and ensure transparency.

Debates continue on whether artificial intelligence should be entrusted with deciding routine or low-complexity cases on its own. Some jurists view this as a logical next step to address mounting pendency and administrative burden, particularly in matters involving standardised facts or clear statutory mandates.

Others, however, caution that adjudication is not a purely mechanical exercise. It involves human judgment, sensitivity to context, and an appreciation of fairness that technology cannot fully replicate. Consequently, any move towards autonomous AI-based adjudication must be carefully designed within strong legal, ethical, and procedural safeguards, ensuring meaningful human oversight and the protection of fundamental rights at every stage of the process.

10. Conclusion and Suggestions

Digital justice in India has advanced significantly from isolated digital solutions to an integrated, strategic mission under e-Courts Phase-III. These efforts have contributed to reducing transactional barriers, expanding remote access, and enhancing transparency. Nonetheless, ensuring equitable access, infrastructure readiness, digital literacy, cybersecurity, and procedural fairness are essential to sustain the promise of digital justice.

11. Policy Recommendations:

- Strengthen rural connectivity and affordable internet access.
- Institutionalise digital literacy programs targeting litigants, lawyers, and court staff.
- Enact comprehensive data protection and cybersecurity legislation tailored for judicial data.
- Adopt hybrid court models that combine digital and physical processes for those unable to access online tools.
- Incorporate ethical guidelines for AI use in judicial functions.

The future of Indian justice lies in balancing technological innovation with constitutional guarantees of equality, dignity, and fair process.

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CHAPTER-18

SUSTAINABLE DEVELOPMENT FOR AN INCLUSIVE INDIA: A PATHWAY TO POVERTY ERADICATION AND ECONOMIC EQUITY

MADHUPARNA SARKAR

Student, School of Law, Brainware university

PUJA DEBNATH

Student, School of Law, Brainware University

RIMA MANNA

Student, School of Law, Brainware University

1. Introduction

Poverty in India is multifaceted, extending far beyond lack of income to include limited access to nutritious food, quality healthcare, education, housing, and sustainable livelihoods. While India's economic transformation over the last three decades has raised millions above traditional income-based poverty lines, chronic deprivation persists when measured using multidimensional frameworks such as the Multidimensional Poverty Index (MPI). According to recent assessments, approximately 16.4 per cent of India's population continues

to experience multidimensional poverty, with a further 18 per cent classified as vulnerable to falling back into deprivation without systemic support.

Sustainable development provides a way of thinking that moves beyond short-term relief or welfare assistance and looks instead at long-lasting, structural change. It brings together economic growth, social inclusion, and environmental responsibility, recognising that these elements must progress together if poverty is to be genuinely reduced. In India, this approach is firmly rooted in the constitutional vision. The interpretation of Article 21 as protecting the rights to livelihood, health, and a dignified life, along with the guiding principles laid down in the Directive Principles of State Policy, places a clear responsibility on the State to pursue policies that meaningfully address poverty. Courts have consistently reinforced this view, emphasising that access to basic necessities such as food, shelter, and medical care is not a matter of charity or discretion, but an essential part of the right to live with dignity.

In the post-pandemic era, central and state governments have actively reoriented welfare schemes to align with sustainable development goals. Initiatives such as the Pradhan Mantri Garib Kalyan Anna Yojana (PMGKAY), Ayushman Bharat – Pradhan Mantri Jan Arogya Yojana (PM-JAY), and the recent reforms in rural employment guarantees represent a synthesis of welfare and long-term development logic. This paper critically examines how these interventions contribute to poverty eradication and equitable economic development, the legal infrastructure enabling them, the challenges encountered, and prospective reforms necessary to ensure expanded inclusion.

2. Conceptual Understanding of Poverty and Sustainable Development

1 Re-Defining Poverty in the Indian Context

Historically, Indian policy measured poverty primarily by income or consumption thresholds. Yet, modern approaches recognise poverty as multidimensional deprivation, capturing deficits in health, education, living standards, and access to basic services. This expanded lens is reflected in NITI Aayog's use of MPI indicators, which account for nutrition, sanitation, schooling, housing quality, and access to electricity. Multidimensional measures thus provide a more holistic understanding of individual and household well-being.

Such multidimensional deprivation is deeply intertwined with historical

inequalities of caste, gender, and geography. Rural populations, scheduled caste and tribal communities, and informal sector workers are disproportionately affected. Consequently, any meaningful strategy to eradicate poverty must integrate access to employment, social security, and governance systems that promote equity.

2 Sustainable Development: Principles and Relevance

“Sustainable development” is a stewardship approach that balances economic growth with social justice and environmental sustainability. In the Indian policy context, this translates into:

- Ensuring food and nutritional security
- Expanding universal healthcare
- Guaranteeing affordable and adequate housing
- Creating skills and employment opportunities
- Integrating environmental sustainability into economic activities
- Strengthening institutional governance

The United Nations’ 2030 Sustainable Development Goals (SDGs) provide an international framework, but India’s strategy must also be tailored to its socio-cultural and demographic specificities — addressing exclusion, decentralised planning, and equitable resource allocation.

3. Constitutional and Legal Framework for Poverty Alleviation

1 Article 21: Right to Life and Dignity

The Supreme Court of India has repeatedly interpreted Article 21 of the Constitution to encompass socio-economic rights that are essential to dignity and survival. In *Olga Tellis v. Bombay Municipal Corporation*, the Court held that the right to livelihood is inseparable from the right to life.¹ Similarly, in *Chameli Singh v. State of Uttar Pradesh*, the Court recognised the right to shelter as a component of Article 21.²

Through these judicial pronouncements, essential needs such as shelter, food, healthcare, and livelihood are no longer treated as optional policy goals left to government discretion. Instead, they are recognised as constitutional commitments that lie at the heart of a dignified life. This understanding makes it clear that conditions linked to poverty cannot be ignored or addressed only through temporary measures, but must be confronted through meaningful laws

and sustained public policies that actively protect and support those in need.

2 Directive Principles of State Policy

Articles 38 through 47 (DPSPs) mandate the State to strive for social and economic justice, reduce inequalities, ensure adequate means of livelihood, and improve public health and nutrition. Though non-justiciable, DPSPs inform legislative and policy actions. They provide constitutional legitimacy for programmes such as PMGKAY, PM-JAY, MGNREGA, and housing initiatives, which seek to realise equitable growth and inclusive development.

4. Government of India Schemes Promoting Sustainable Development

The Government of India has put in place a wide range of schemes designed to tackle poverty at its roots rather than merely easing its symptoms. These programmes address everyday realities that shape people's lives—access to adequate food, opportunities for steady work, affordable healthcare, safe housing, social security, skill development, and sustainable livelihoods. Together, they reflect an understanding that lasting poverty reduction depends on strengthening all these interconnected pillars of sustainable development, so that individuals and families can build secure and dignified lives over the long term.

1 Food and Nutritional Security

Ensuring food security remains central to poverty eradication. Under the National Food Security Act, 2013, vulnerable families receive subsidised grains through the Public Distribution System. This foundation has been reinforced by the Pradhan Mantri Garib Kalyan Anna Yojana (PMGKAY), which at its peak provided free food grains to over 80 crore vulnerable citizens during and beyond the COVID-19 crisis, preventing sharp increases in hunger and chronic deprivation.

This approach signifies a shift from reactive relief to rights-oriented entitlements, ensuring households possess consistent access to staple nutrition, which in turn supports health, school attendance, and productive capacity.

2 Employment Guarantee and Rural Livelihoods

Employment security is a cornerstone of sustainable development. The landmark Mahatma Gandhi National Rural Employment Guarantee Act

(MGNREGA), 2005, guaranteed up to 100 days of paid work annually to rural households, strengthening resilience during economic shocks. Though recently replaced by the Viksit Bharat–Guarantee for Rozgar and Ajeevika Mission (Gramin) Act, 2025, which increases statutory guaranteed days to 125, there is ongoing debate over the administrative and funding shift embedded in the new framework. Critics argue that transitioning from a demand-driven wage guarantee to a budget-allocated model could undermine its protective intent, especially in financially weaker states.

Even though the reform has attracted criticism, its underlying intention is clear. By increasing the number of guaranteed workdays and introducing more advanced monitoring systems, the policy seeks to strengthen long-term rural employment rather than offering short-term relief. The emphasis is on creating durable assets, improving accountability, and helping rural households diversify their sources of livelihood, so that employment support becomes a foundation for lasting economic security rather than a temporary safety net.

3 Health Protection and Medical Security

The Ayushman Bharat – Pradhan Mantri Jan Arogya Yojana (AB-PMJAY) provides health coverage up to ₹5 lakh per family per year, protecting low-income households from catastrophic healthcare costs. As of early 2025, nearly 39.94 crore Ayushman cards have been issued, making it one of the largest government health protection initiatives globally.

This scheme contributes to sustainable development by ensuring that healthcare shocks do not push households back into poverty. It also supports preventive and primary care through Health and Wellness Centres that strengthen local health systems.

4 Housing for All

Adequate housing is a fundamental aspect of dignified living. The Pradhan Mantri Awaas Yojana (Gramin) has been extended through 2029 with expanded eligibility criteria and enhanced financial assistance to construct or improve rural homes. The ongoing “Awaas+” mobile survey initiative ensures broader coverage of unserved families, enabling greater inclusivity for marginalised households.

Housing security underpins health, education, and employment, making it an important contributor to long-term economic equity.

5 Skills and Livelihood Development

The Skill India Mission, including initiatives such as the Pradhan Mantri Kaushal Vikas Yojana (PMKVY), is built around the idea that meaningful employment depends not just on availability of jobs, but on people having the right skills to access them. By providing training that is aligned with industry needs, these programmes aim to help young people and unemployed adults move away from insecure, low-paid informal work and into more stable and better-remunerated jobs in the formal sector. In many states, this effort is being strengthened through locally tailored innovations. For example, industry-linked apprenticeship programmes in Uttar Pradesh connect training directly with real workplace experience, improving employability and opening clearer pathways to long-term livelihoods for young people.

Skill development is critical for breaking cycles of generational poverty by increasing employability and broadening income-earning opportunities.

5.Sustainable Development and Economic Equity

Sustainable development aims not just at economic growth but at equitable distribution of opportunities, resources, and outcomes across diverse sections of society.

1 Social Protection and Inclusion

Government efforts to expand social protection have yielded measurable improvements. According to recent International Labour Organisation (ILO) assessments, India's social security coverage nearly doubled between 2021 and 2024, covering approximately 65 per cent of the population under at least one social security measure, including PMGKAY, AB-PMJAY, E-Sharm, and the Atal Pension Yojana.

Such expansions strengthen economic equity by reducing vulnerability and facilitating productive participation.

2 Rural and Urban Disparity Reduction

Efforts to strengthen rural development, when combined with urban sustainability initiatives such as the Smart Cities Mission, reflect an attempt to reduce long-standing disparities in infrastructure, services, and opportunities between rural and urban India. Although the Smart Cities Mission formally concluded in 2025, the investments made under it—particularly in areas like

improved water supply systems, renewable energy use, efficient public transport, and digital connectivity—continue to shape more liveable and inclusive urban spaces. These improvements not only benefit city residents but also create economic linkages and employment opportunities that extend to surrounding rural areas.

At the same time, achieving genuine equity requires focused attention on communities that have historically remained on the margins of development. Financial inclusion programmes, support for self-help groups, and women-centred initiatives play a critical role in this process. For instance, schemes such as the recently introduced Subhadra Yojana in Odisha go beyond welfare assistance by providing direct financial support and incentives to economically vulnerable women. By strengthening women's financial independence and encouraging entrepreneurial activity, such initiatives help transform beneficiaries into active participants in local economies, thereby fostering more inclusive and sustainable development.

6.Implementation Challenges

Despite these extensive policy frameworks, several operational and structural challenges remain:

- **Implementation Gaps:** Bureaucratic delays, leakages, and uneven state-level capacity often dilute policy impact.
- **Digital Divide:** Increasing digital delivery of services can inadvertently exclude individuals with limited digital access or literacy.
- **Informal Sector Vulnerability:** A large informal workforce remains outside formal social security coverage despite schemes such as E-Shram.
- **Funding and Fiscal Pressures:** Shifts in funding responsibilities between central and state governments — especially in rural employment schemes — create fiscal stress for weaker states.
- **Environmental Impact Considerations:** Sustainable development necessitates balancing growth with environmental protection, requiring stronger legal frameworks for climate resilience.

Addressing these challenges requires not only improved governance but also decentralised planning and community participation.

7.Role of Law and Legal Reforms

Law is critical in institutionalising sustainable development by embedding social rights into enforceable standards. Progressive legal reforms could strengthen protections for informal sector workers, enshrine minimum living standards, and embed environmental safeguards into economic policies.

Judicial interpretation has already played a role by extending socio-economic rights under Article 21. Future legal reforms should emphasise accountability mechanisms, community participation rights, and transparent grievance redressal systems.

8.Conclusion and Suggestions

Sustainable development is both an ethical imperative and a practical necessity for inclusive growth. India's multifaceted poverty eradication strategies reflect this principle, combining food security, employment guarantees, healthcare access, housing, and skill development to build resilient livelihoods.

To consolidate these gains and move towards equitable and enduring poverty eradication, the following actions are imperative:

- Strengthen inter-sectoral coordination and data integration across schemes.
- Expand digital and financial inclusion efforts for marginalised groups.
- Enhance social protection coverage for informal sector workers.
- Maintain strong legal safeguards to protect socio-economic rights.
- Ensure environmental sustainability is embedded in development planning.

Ultimately, poverty eradication must be pursued not merely as a numerical target but as the expansion of human dignity and opportunity.

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