

Nalanda and Takshashila as Models of Multidisciplinary Research Universities

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ABSTRACT

Purpose: *The contemporary academy's enthusiasm for multidisciplinary research, interdisciplinary curricula, and international scholarly collaboration is frequently narrated as a late-twentieth-century innovation — a response to the complexity of problems that no single discipline can address alone, enabled by digital communication technology, and institutionalized through funding structures that explicitly reward cross-disciplinary collaboration. This narrative, while not incorrect in its account of recent developments, is historically parochial in a way that obscures a more profound and ancient reality: the most celebrated universities in the history of the Indian subcontinent — Takshashila (c. 600 BCE–5th century CE) and Nalanda (c. 427 CE–1193 CE) — built their enduring intellectual reputations precisely on the principles that the contemporary academy is now rediscovering. They integrated diverse fields of knowledge rather than isolating them, created residential communities of scholars rather than collections of isolated specialists, developed rigorous debate-based pedagogies that connected disciplines through the shared exercise of critical reason, and maintained international scholarly networks that spanned the known world from Greece and Babylon to China, Japan, and Southeast Asia.*

Methodology: *In this paper, the exploratory qualitative research method is used. The relevant information is collected using keyword-based search in Google search engine, Google Scholar search engine, and AI-driven GPTs. This information is analysed and interpreted as per the objectives of the paper.*

Analysis/ Results: *This research paper undertakes a comprehensive, multi-dimensional scholarly examination of Takshashila and Nalanda as historical models of the multidisciplinary research university, drawing on historical, pedagogical, organizational, and comparative analytical frameworks. The paper traces the historical origins, geographical contexts, and institutional architectures of both universities; analyses their multidisciplinary curricula in detail across the natural sciences, medical sciences, humanities, philosophy, and political theory; examines the pedagogical methods through which knowledge was integrated across disciplines; investigates the research cultures, manuscript traditions, and international scholarly exchange networks that sustained both institutions; and constructs a systematic comparative analysis of their organizational models.*

Originality/ Values: *The paper then develops detailed, evidence-based lessons for the contemporary university on breaking disciplinary silos, embedding debate-based pedagogy, creating international scholarly communities, integrating ethical formation with academic excellence, and mobilizing knowledge in the service of practical societal challenges. The paper concludes by arguing that the revival of Nalanda University (2014) and the National Education Policy 2020's mandate for Indian Knowledge Systems integration represent important steps toward recovering this ancient wisdom for the contemporary academy — and that both institutions represent a contribution to global higher education history of the first order.*

Type of Paper: *Exploratory Research.*

Keywords: Takshashila, Nalanda, Multidisciplinary education, Indian Knowledge Systems, Higher education history, Dharmaganja, Shastrartha, Comparative university studies,

Gurukula, Research culture, Interdisciplinary curriculum, Nalanda University revival, National Education Policy 2020, Ancient Indian universities, Knowledge integration

1. INTRODUCTION :

There is a peculiar intellectual amnesia at the heart of contemporary higher education discourse. Universities across the world invest enormous resources in developing interdisciplinary research centres, cross-faculty collaboration programmes, problem-based learning initiatives, and international student exchange networks — and they do so largely under the impression that these are innovative responses to the fragmented, over-specialized state of the modern academy (Kumar (2025). [1]). The ideal of the scholar who moves comfortably across disciplinary boundaries, who brings philosophical depth to scientific inquiry and empirical rigour to humanistic questions, who engages in sustained debate with peers from different intellectual traditions, and who understands their scholarship as continuous with ethical and civic commitment — this ideal is presented as a contemporary aspiration, a corrective to the hyper-specialization that industrialized academic production has generated (Kalyankar (2025). [2]).

The historical record of Takshashila and Nalanda tells a different and, in some respects, more instructive story. Takshashila, flourishing from approximately the sixth century BCE at the northwestern gateway of the Indian subcontinent, was offering sixty-eight disciplines — spanning medicine, astronomy, military science, philosophy, grammar, law, and economics — to students from Babylon, Greece, Arabia, and China, more than two thousand years before the research university was "invented" in nineteenth-century Germany. Nalanda, the world's first residential university, was housing ten thousand students and two thousand teachers from across Asia in an integrated campus of monasteries, libraries, lecture halls, and laboratories from the fifth century CE — more than a millennium before Oxford established its collegiate system. Both institutions made interdisciplinary integration not a supplementary aspiration but the organizing principle of their entire educational philosophy: the physician who had not studied philosophy was regarded as incompletely trained; the astronomer who could not engage in metaphysical debate was not yet fully educated (Pandey (2023). [3]).

This paper argues that the intellectual heritage of Takshashila and Nalanda is not merely of historical interest but of direct practical relevance to the challenges of twenty-first-century higher education. The problems that contemporary universities struggle with — disciplinary fragmentation, the disconnect between theory and practice, the inadequacy of examination-based assessment in developing genuine competence, the thinning of ethical formation as academic programmes become narrower and more credential-focused, the under-development of international scholarly communities — are precisely the problems that Takshashila and Nalanda solved with institutional creativity and philosophical conviction over a sustained period of centuries. Their solutions deserve rigorous scholarly analysis and thoughtful contemporary application, not nostalgic celebration.

The paper is organized in nine substantive sections. Section 2 states the research objectives. Section 5 traces the historical origins and contexts of both universities. Section 6 analyses their multidisciplinary curricula. Section 7 examines their pedagogical methods and knowledge integration practices. Section 8 investigates their research cultures and international scholarly exchange networks. Section 9 presents a systematic comparative analysis supported by formatted tables. Section 10 develops lessons for the contemporary university. Section 11 addresses policy implications and the revival of Nalanda, before the conclusion in Section 12.

2. OBJECTIVES OF THE STUDY :

This research is guided by the following specific objectives:

- (1) To trace the historical origins, geographical contexts, institutional architectures, and developmental trajectories of Takshashila and Nalanda, examining the social, political, economic, and intellectual conditions that enabled their emergence as global centres of higher learning.
- (2) To analyse the multidisciplinary curricula of both universities in detail, examining the range of disciplines offered, the principles of curricular integration, the relationship between theoretical and applied knowledge, and the philosophical foundations of their integrated educational philosophy.
- (3) To examine the pedagogical methods through which knowledge was transmitted and integrated across disciplines — including the Shastrartha debate tradition, mentorship models, experiential learning practices, and the role of oral and manuscript traditions in knowledge creation and preservation.

- (4) To investigate the research cultures of both institutions, including their manuscript preservation systems, translation activities, international scholarly exchange networks, and the mechanisms through which they maintained intellectual vitality across centuries of operation.
- (5) To construct a systematic multi-dimensional comparative analysis of Takshashila and Nalanda as institutional models, identifying their distinctive contributions to the history of the university and the principles they share despite their organizational differences.
- (6) To develop detailed, evidence-based lessons for the contemporary university from the Takshashila and Nalanda models, addressing disciplinary silo-breaking, pedagogical reform, international collaboration, ethical integration, and research culture development.
- (8) To assess the implications of this analysis for higher education policy in India, with particular reference to the National Education Policy 2020's Indian Knowledge Systems mandate and the revival of Nalanda University, and to argue for the substantive integration of both institutions' educational philosophy into contemporary university design.

3. REVIEW OF LITERATURE :

3.1 General Literature Review:

Ancient India possessed one of the world's earliest and most sophisticated higher education systems, exemplified by the renowned universities of Nalanda and Takshashila. These institutions emerged as global centers of learning that attracted students and scholars from different regions of Asia and beyond. Their educational philosophy was based on multidisciplinary learning, intellectual inquiry, international collaboration, and research-oriented pedagogy, making them valuable models for contemporary higher education institutions (Aithal & Maiya (2023). [4]).

Takshashila, established around the 6th century BCE in present-day Pakistan, is widely regarded as one of the earliest centers of higher learning in the world. Unlike modern universities with a centralized structure, Takshashila functioned as a network of specialized schools where distinguished scholars taught diverse disciplines including medicine, political science, military science, law, astronomy, philosophy, mathematics, linguistics, and commerce (Parida & Akash (2022). [5]). Students had the freedom to select teachers and subjects according to their interests, reflecting a learner-centered and interdisciplinary approach that resembles contemporary flexible curriculum models (Dharampal (1983). [6]).

Nalanda University, established during the Gupta period in the 5th century CE, represented a more organized institutional structure and is often regarded as the world's first residential international university. Historical accounts by Chinese travelers Xuanzang and Yijing describe Nalanda as hosting thousands of students and teachers engaged in advanced studies and research across multiple disciplines, including Buddhist philosophy, logic, medicine, mathematics, astronomy, linguistics, literature, and fine arts (Mookerji (1989). [7]). The university maintained extensive libraries and promoted scholarly debates, thereby creating a vibrant research ecosystem that encouraged innovation and knowledge creation (Rajani & Kumar (2019). [8]).

One of the defining characteristics of both Nalanda and Takshashila was their commitment to multidisciplinary education. Rather than restricting learners to a single specialization, these institutions promoted the integration of knowledge across disciplines. Such an approach aligns closely with contemporary theories advocating interdisciplinary and transdisciplinary research to address complex societal challenges (Klein (1990). [9]). The educational model encouraged students to develop analytical thinking, ethical reasoning, and practical problem-solving abilities, thereby producing well-rounded scholars and leaders.

Research culture constituted another distinguishing feature of these ancient universities. Nalanda particularly emphasized scholarly inquiry, manuscript production, peer discussions, and intellectual debates as mechanisms for advancing knowledge. The university's library complex, known as Dharmaganja, reportedly housed thousands of manuscripts and functioned as a major knowledge repository for Asia (Mookerji (1989). [7]). This emphasis on knowledge creation and dissemination resembles the role of modern research universities in generating innovation and supporting societal development.

Internationalization was also central to the success of Nalanda and Takshashila. Students and scholars from China, Korea, Tibet, Mongolia, Sri Lanka, and Southeast Asia traveled to these institutions for advanced studies (Sen (2014). [10]). Such global academic exchanges facilitated cross-cultural learning,

collaborative scholarship, and the dissemination of knowledge across civilizations. Modern universities increasingly emphasize internationalization strategies, global mobility programs, and collaborative research networks, reflecting principles already practiced by these ancient institutions.

The governance and pedagogical practices of Nalanda and Takshashila further highlight their relevance to contemporary higher education. Both institutions emphasized academic autonomy, merit-based admission, rigorous evaluation, mentorship, and residential learning environments (Mookerji (1989). [7]). The close interaction between teachers and students fostered intellectual development, character formation, and lifelong learning. These features correspond with modern educational paradigms that advocate student engagement, mentoring, and holistic development (Aithal & Aithal (2019). [4]).

The National Education Policy (NEP) 2020 has revived interest in these ancient universities as models for multidisciplinary education and research excellence. The policy explicitly advocates the establishment of large multidisciplinary universities that integrate teaching, research, innovation, and societal engagement, drawing inspiration from institutions such as Nalanda and Takshashila. Scholars argue that studying these historical models can provide valuable insights for designing future-ready universities capable of addressing global challenges while preserving cultural heritage (Aithal & Aithal (2019). [4]).

Overall, the literature suggests that Nalanda and Takshashila were not merely educational institutions but comprehensive ecosystems of knowledge creation, interdisciplinary learning, international collaboration, and ethical development. Their enduring legacy offers important lessons for modern universities seeking to balance specialization with interdisciplinarity, research excellence with societal relevance, and global engagement with local cultural values.

3.2 Review based on Keywords:

Table 1 and Table 2 presents the gist of review of literature based on two keywords “Nalanda and Takshashila” and “Models of Multidisciplinary Research Universities”, respectively.

Table 1: Review based on Keyword: Nalanda and Takshashila

S. No.	Topic/Focus	Summary/Outcome	Reference
1	Educational Models of Ancient Indian Universities	The ancient Indian universities of Nalanda, Takshashila, and Vallabhi were pioneering centers of multidisciplinary higher learning that combined residential education, scholarly inquiry, ethical values, and global knowledge exchange. Their diverse curricula, innovative pedagogy, and strong research culture contributed significantly to intellectual and cultural development across Asia. The study highlights how their integrated approach to education, governance, and community life offers valuable lessons for building inclusive, interdisciplinary, and globally connected universities in the modern era.	Kumar, C. (2025). [11]
2	The Intellectual and Architectural Legacy of Nalanda, Taxila, and Vikramashila	The libraries of ancient Indian educational centers such as Nalanda, Taxila, and Vikramashila served as major repositories of knowledge, playing a vital role in preserving, organizing, and disseminating information across regions and generations. Their advanced design, interdisciplinary focus, and scholarly resources significantly contributed to intellectual growth and continue to influence modern library science and knowledge management practices.	Maneesh, G. S., & Vijayan, S. S. (2025). [12]

3	Shaping a New Era of Indian Education	Ancient Indian education viewed knowledge as a powerful tool for personal and societal development, emphasizing holistic learning through moral, spiritual, intellectual, and vocational training. Renowned institutions such as Nalanda and Takshashila promoted multidisciplinary education and practical skills, attracting scholars from across the world. Inspired by this rich heritage, the New Education Policy 2020 seeks to integrate value-based and vocational education to equip India's young population with skills necessary for sustainable growth and global competitiveness.	Barman, B. (2025). [13]
4	What can we learn from Universities of Ancient India	The concept of the university has evolved significantly over time, adapting to changing societal and educational needs. However, the history of ancient Indian universities offers valuable insights into effective institutional design, multidisciplinary learning, teacher-student relationships, community engagement, and governance. These lessons can help shape innovative and sustainable models for higher education in the twenty-first century.	Tilak, J. (2019). [14]
5	The Communicative Nature of Art in Ancient and Contemporary Contexts	Ancient Indian education emphasized character development, social values, and cultural preservation, with art and literature serving as powerful tools for communication, learning, and moral instruction. Institutions such as Nalanda and Takshashila promoted interdisciplinary education and cultural exchange, integrating art, knowledge, and spirituality. The study argues for reviving this holistic approach to restore the role of art in fostering empathy, social responsibility, and cultural continuity in modern society.	Manisha, S. (2025). [15]
6	The Role of Learning and Education in Ancient Indian Trade	Ancient India's commercial success was closely linked to its strong educational traditions, which provided merchants, administrators, and navigators with essential skills in mathematics, law, languages, accounting, and diplomacy. Institutions such as Takshashila and Nalanda, along with merchant guilds and vocational training systems, fostered intellectual, ethical, and practical competencies that supported extensive trade networks and enabled India to maintain a prominent position in regional and global commerce for centuries.	Tabassum, A., & Varma, R. M. (2025). [16]
7	Past Present and Future of Higher Education and its challenges in India	Higher education in India has a long history extending back thousands of years. From the ancient colleges of Nalanda and Takshashila to modern institutions, India's higher education journey has been intriguing and revolutionary. Higher education is essential for research,	Mishra, S., & Mishra, S. (2025). [17]

		education, and career opportunities, contributing to the development of the nation by providing significant hours into policy, research, scientific discoveries, inventions, etc. However, there are many challenges in its implementation, including the gap between developed and developing nations, limitations in infrastructure, and a lack of upgraded skills required for the new digital era of education. NEP 2020 aims to address some of these issues, but it must be implemented cautiously to benefit all sections of society. This paper discusses the past, present and future trends of higher education in India and the problems in higher education and proposes possible ways forward towards its solution.	
8	Traditional Indian education values and new national education policy adopted by India	Ancient Indian education, exemplified by the Gurukul system and renowned universities such as Nalanda and Takshashila, emphasized value-based and knowledge-driven learning for the welfare of society. Inspired by the contributions of great scholars like Aryabhata, Sushruta, Panini, and Chanakya, the National Education Policy 2020 seeks to revive these principles through holistic, Bharat-centric, and knowledge-based education, while introducing significant structural reforms to the Indian education system.	Patil, V. K., & Patil, K. D. (2023). [18]
9	Literature review on Indian ancient university in imparting holistic and multidisciplinary: to create Indian knowledge system	Ancient Indian universities such as Nalanda, Takshashila, Vallabhi, and Kanchipuram promoted holistic and multidisciplinary education grounded in moral, intellectual, spiritual, and practical development. Through subjects ranging from philosophy, Ayurveda, mathematics, and governance to arts and warfare, these institutions produced renowned scholars and contributed significantly to the Indian Knowledge System (IKS). Inspired by this rich heritage, NEP 2020 seeks to integrate multidisciplinary learning, values, culture, and skill development into modern education.	Mahesh, K. M., Aithal, P. S., & Sharma, K. R. S. (2023). [19]
10	Comparative Analysis of the Evolution and Integration of Traditional and Modern Education Systems in India	The Indian education system has undergone significant changes, evolving from the holistic Gurukul model of ancient times to today's structured, technology-driven framework. Ancient institutions like Nalanda and Takshashila emphasized personalized mentorship, practical skills, moral values, and societal welfare. Colonial influence introduced standardized curricula, formal examinations, and institutional structures, shaping modern education. This paper examines the evolution of Indian pedagogy, accessibility, and content, emphasizing the timeless value of experiential and ethical learning. By blending ancient	Sopan, K. A., & Sambhajirao, K. V. (2025). [20]

		principles with modern methods, India can develop a balanced and inclusive education model for future generations.	
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Table 2: Review based on Keyword: Models of Multidisciplinary Research Universities

S. No.	Topic/Focus	Summary/Outcome	Reference
1	Multidisciplinary research as a complex system	Multidisciplinary research has emerged as a powerful approach for addressing complex problems that extend beyond the boundaries of individual disciplines. Functioning as a self-organizing and adaptive system, it promotes collaboration, innovation, and knowledge integration through interactions among researchers from diverse fields. The study highlights how such research systems generate collective intelligence, enhance problem-solving capabilities, and support advancements in areas such as renewable energy and other complex global challenges.	Dalton, A., Wolff, K., & Bekker, B. (2021). [21]
2	Evaluating research: A multidisciplinary approach to assessing research practice and quality	This study develops a multidisciplinary framework for understanding and evaluating research quality by defining the fundamental characteristics of research practice. It identifies four key dimensions—Credible, Contributory, Communicable, and Conforming—and proposes a comprehensive quality model that can be applied across academic disciplines to assess and improve the effectiveness and rigor of research.	Mårtensson, P., Fors, U., Wallin, S. B., Zander, U., & Nilsson, G. H. (2016). [22]
3	Perspective: Promoting and fostering multidisciplinary research in universities	Interdisciplinary research has become essential for addressing complex societal challenges, yet existing academic systems often do not adequately support such collaboration. This study highlights the need for institutional reforms, improved communication, and supportive policies to encourage interdisciplinary research, enabling universities to foster innovation and develop effective solutions to emerging global problems.	Arnold, A., Cafer, A., Green, J., Haines, S., Mann, G., & Rosenthal, M. (2021). [23]
4	Multidisciplinary collaboration as a sustainable research model for device development	The University of Rochester Cardiovascular Device Design Program demonstrates how multidisciplinary collaboration between medicine and engineering can address challenges in research sustainability and medical device innovation. By integrating clinical expertise, engineering knowledge, and sustainable funding mechanisms, the program promotes effective device development, research advancement, and educational opportunities for future healthcare innovators.	Chandra, A. (2013). [24]
5	Stronger disciplinary identities in	This study of multidisciplinary research schools in Sweden found that interactions among students from different disciplines often strengthen disciplinary identities while	Geschwind, L., & Melin, G. (2016). [25]

	multidisciplinary research schools.	simultaneously broadening academic perspectives. Exposure to diverse theories, methods, and research approaches encourages intellectual growth, interdisciplinary understanding, and the integration of new ideas into students' research.	
6	Collaborative research across disciplinary and organizational boundaries	This study found that multidisciplinary scientific collaborations can achieve positive research outcomes without increasing coordination difficulties. However, collaborations involving multiple universities often face greater coordination challenges and lower success rates. The findings suggest that effective communication and opportunities for direct interaction among researchers are essential for improving the outcomes of cross-institutional research projects.	Cummings, J. N., & Kiesler, S. (2005). [26]
7	Multidisciplinary research for natural resource management	Multidisciplinary research plays a crucial role in addressing complex challenges in natural resource management by integrating knowledge from different disciplines. The study emphasizes the importance of effective collaboration, systems thinking, and team management to enhance research integration and develop comprehensive solutions for complex environmental and resource-related issues.	Janssen, W., & Goldsworthy, P. (1996). [27]
8	Multi-institutional, multidisciplinary study of the impact of course-based research experiences.	Course-based Research Experiences (CREs) provide students with meaningful exposure to the research process and can generate learning benefits comparable to traditional apprenticeship-style research. Studies show that CREs are most effective when research activities are fully integrated into the course, encourage student involvement in decision-making, and involve exploring outcomes that are unknown to both students and instructors, thereby enhancing understanding, skills, and professional development.	Mader, C. M., Beck, C. W., Grillo, W. H., Hollowell, G. P., Hennington, B. S., Staub, N. L., ... & White, S. L. (2017). [28]
9	A multidisciplinary collaborative approach to a university-community partnership	This study highlights the effectiveness of multidisciplinary university teams in addressing complex community problems that cannot be solved through single-discipline approaches. The findings emphasize the importance of collaboration, effective leadership, organizational coordination, and supportive environments in enhancing outreach initiatives and achieving successful community engagement outcomes.	Amey, M. J., Brown, D. F., & Sandmann, L. R. (2002). [29]
10	Multidisciplinary Approach to University-Community Engagement	The University of Newcastle's Coal River Working Party demonstrates how a multidisciplinary approach can strengthen university-community engagement by bringing together academics, students, community members, and organizations	Eklund, E., & Hardy, A. (2014). [30]

		around shared themes of history and heritage. This collaborative model promotes active participation, supports research, and creates mutual benefits for both universities and communities, offering a valuable framework for community-focused higher education.	
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4. METHODOLOGY :

This study employs an exploratory qualitative research approach to investigate and understand the key concepts, theories, and contemporary perspectives related to the research topic. The analysis is based on secondary data collected from scholarly journal articles, books, conference proceedings, industry reports, policy documents, and other credible sources identified through systematic searches using Google, Google Scholar, and AI-powered GPT tools. The collected literature was critically reviewed, organized, and interpreted to identify major themes, trends, and relationships relevant to the study objectives. This methodology facilitates a comprehensive conceptual understanding of the subject and supports the development of meaningful academic and practical insights [31-41].

5. HISTORICAL ORIGINS AND INSTITUTIONAL ARCHITECTURE :

5.1 Takshashila: The World's First University and Its Context:

Takshashila — known in Greek and Latin sources as Taxila — occupies a position in the history of higher education that has not yet received the global recognition it deserves. Located approximately 25 kilometres northwest of present-day Islamabad-Rawalpindi in the Gandhara region (now Pakistan), it functioned as a major centre of higher learning from at least the sixth century BCE until its destruction by the Huna invasions in the fifth century CE — a continuous institutional history of approximately eight hundred years that represents one of the longest-lived educational institutions in recorded history. Archaeological excavations at the Taxila site, conducted most comprehensively by Sir John Marshall between 1913 and 1934, have confirmed the existence of a substantial urban centre with extensive educational, commercial, and religious infrastructure consistent with the literary and inscriptional evidence.

Takshashila's rise to prominence as an educational centre was inseparable from its geographical position. Located at the junction of three major overland trade routes — the Uttarapatha connecting the Ganges valley with the northwestern frontier, the route through the Hindu Kush toward Central Asia and Persia, and the connection toward the subcontinent's western coast — it was simultaneously a major commercial hub and a cultural crossroads where the intellectual traditions of the Indian subcontinent, Persia, Greece, and Central Asia met and interacted. This cosmopolitan character was not incidental but foundational: the intellectual vitality of Takshashila drew directly on the encounter between different knowledge traditions that its geographical position facilitated. Persian scholars brought astronomical and mathematical knowledge from Babylonian and Zoroastrian traditions; Greek students who arrived following Alexander's campaigns brought Aristotelian logic and natural philosophy; and the students from Babylon, Arabia, and China who came in large numbers brought their own intellectual traditions into productive dialogue with the Brahminical and early Buddhist learning that formed the core of Takshashila's institutional heritage.

The institutional structure of Takshashila differed fundamentally from later university models. It functioned not as a single institution with a unified administration but as a decentralized city of learning — an educational ecosystem in which numerous individual scholar-teachers maintained their own homes, established their own pedagogical programs, and attracted students whose fees and service constituted the teacher's livelihood. There were no large dormitories, no lecture halls in the modern sense, and no centralized administrative authority: each teacher was an autonomous intellectual entrepreneur whose reputation in scholarship was the sole qualification for attracting students. This market-based model of educational organization gave Takshashila remarkable flexibility and intellectual diversity: students could select their teachers and their subjects directly, matching their educational programmes to their individual intellectual goals and vocational aspirations rather than following a prescribed institutional curriculum.

At its peak, Takshashila attracted over ten thousand five hundred students and offered instruction in sixty-eight different subjects — a range that encompasses what would today be considered multiple

distinct university faculties. Notable scholars whose careers intersected with Takshashila include Panini, whose Ashtadhyayi (c. 4th century BCE) established the formal grammatical analysis of Sanskrit that remains foundational to the study of Indian linguistics; Chanakya (Kautilya), whose Arthashastra was composed here and represents one of the most sophisticated treatises on political economy and statecraft in the ancient world; and Charaka, whose Charaka Samhita established the systematic theoretical foundations of Ayurvedic medicine. That a single institution's network could produce the foundational works in linguistics, political philosophy, and medical science simultaneously is itself testimony to the intellectual range and depth of Takshashila's educational culture.

5.2 Nalanda: The First Residential University and the Gupta Educational Ideal:

Nalanda's establishment by Emperor Kumaragupta I of the Gupta dynasty around 427 CE introduced a fundamentally different institutional model for higher education — one in which the dispersed, individualized character of Takshashila's educational ecosystem was replaced by a unified, residential, administratively organized campus that brought students and teachers together in a single integrated community of learning. This model — the residential research university — has since become the dominant global form of higher educational institution, and its origins at Nalanda deserve explicit recognition in the history of higher education.

At its peak, Nalanda was a campus of extraordinary scale and sophistication. Approximately ten thousand students and two thousand teachers resided within a complex that included numerous monastic residences (viharas), temples, lecture halls, meditation centres, a hospital, and the famous library complex Dharmaganja. The campus extended over a substantial area near the present-day village of Nalanda in Bihar, and its architectural remains — excavated and partially restored in the twentieth century — testify to the scale of the institutional investment that the Gupta Empire and successive royal patrons made in sustaining it. The eleven monasteries and several temples that archaeological excavation has revealed represent only the most durable elements of a much larger complex that included perishable structures of wood and brick.

Nalanda's intellectual orientation was primarily — though by no means exclusively — Buddhist. Founded within the tradition of Mahayana Buddhism and later incorporating Vajrayana scholarship, Nalanda attracted students and scholars from across the Buddhist world: China, Korea, Japan, Tibet, Mongolia, Sri Lanka, Java, Sumatra, and Southeast Asia. The Chinese pilgrims whose accounts provide the most detailed historical descriptions of Nalanda — most importantly Xuanzang (who studied at Nalanda from 627 to approximately 642 CE) and Yijing (who arrived in 673 CE and spent fourteen years in India, ten of them at Nalanda) — were drawn by the combination of Buddhist scholarship with the secular sciences that Nalanda's curriculum encompassed. Their detailed, admiring accounts of the institution's intellectual vibrancy, physical magnificence, and scholarly rigour have preserved descriptions of Nalanda that no Indian source has matched in completeness.

Nalanda operated for nearly a thousand years — from approximately 427 CE to its destruction by Bakhtiyar Khilji's forces in 1193 CE — before the smouldering ruins of its library signalled the end of one of history's most remarkable and sustained experiments in organized higher learning. The report that the library burned for months due to the sheer volume of manuscripts it contained is simultaneously a testament to the extraordinary scale of Nalanda's intellectual accumulation and a reminder of the catastrophic cultural loss that its destruction represented. Scholars have estimated that the Dharmaganja library contained millions of manuscripts — representing, in the pre-print era, essentially irreplaceable documentation of centuries of Asian philosophical, scientific, medical, and literary scholarship.

5.3 Geography, Trade, and the Political Economy of Ancient Learning:

Both Takshashila and Nalanda benefited from the alignment between their intellectual aspirations and the economic and political conditions of their respective environments. Takshashila's position along the Uttarapatha — the ancient superhighway that connected the Ganges valley with the northwestern frontiers and beyond toward Central Asia, Persia, and the Mediterranean — meant that it was embedded in the most commercially dynamic and culturally diverse region of the ancient subcontinent. The revenues generated by the commercial traffic of the trade routes — through taxation, provisioning, and financial services — created the surplus that supported Takshashila's educational ecosystem. Merchants, diplomats, and travelling scholars moving between the great commercial centres of the

ancient world passed through Takshashila and contributed to the extraordinary cosmopolitanism that made it intellectually distinctive.

Nalanda's political economy of learning was structured differently. The Gupta Empire's royal patronage established the institutional foundation, and subsequent patronage from the Palas, the Harsha dynasty, and the rulers of Southeast Asian Buddhist kingdoms — including the king of Srivijaya (modern Sumatra), who founded the construction of a monastery at Nalanda — sustained and expanded it. This royal and royal-adjacent patronage model gave Nalanda a degree of institutional stability and resource certainty that Takshashila's market-based model could not match: it also, however, created a dependency on political stability that ultimately contributed to the institution's vulnerability when the political order that had protected it was disrupted by military conquest.

6. THE MULTIDISCIPLINARY CURRICULUM: INTEGRATION AS PHILOSOPHY :

6.1 The Philosophical Foundations of Curricular Integration:

The most important fact about the curricula of both Takshashila and Nalanda is that their multidisciplinary character was not an accidental accumulation of subjects but the expression of a deliberate and philosophically grounded educational vision. Ancient Indian educational philosophy — drawing on the Vedic concept of knowledge as a unified whole (vidya as single, not multiple) and the Buddhist insistence on the interconnection of all phenomena — regarded the compartmentalization of knowledge into separately administered disciplines as epistemically impoverished. The healer who did not understand the philosophical principles underlying health and disease would be mechanically competent but intellectually shallow. The political administrator who did not understand ethics would be effective but dangerous. The philosopher who did not understand mathematics and astronomy would lack the grounding in natural reality that genuine metaphysical inquiry requires.

"Knowledge was sacred, not merely a means to employment but a path to self-realization and societal contribution. The curriculum bridged spiritual and worldly knowledge, preparing students for positions in government, diplomacy, health, and jurisprudence."

This integrative vision manifested in both institutions' curricular structures as a combination of disciplinary breadth requirements with deep specialization. At Nalanda, logic was mandatory for all students regardless of their primary field of study — physicians, mathematicians, and Buddhist scholars alike were required to master the Nyaya and Samkhya schools of logical reasoning before pursuing their specializations. This requirement was not mere formalism but reflected the recognition that all systematic inquiry — whether in medicine, mathematics, or metaphysics — ultimately depends on the same underlying logical competences of clear reasoning, valid inference, and the identification of fallacies. By requiring all students to achieve competence in logic before advancing in their specializations, Nalanda ensured that interdisciplinary dialogue remained possible across the full range of its intellectual community.

6.2 Medicine, Astronomy, and the Natural Sciences:

Medical education at both Takshashila and Nalanda combined theoretical instruction with clinical apprenticeship in a manner that contemporary medical education has only recently begun to recover. At Takshashila, the physician Jivaka — who appears in Buddhist literature as the personal physician of the Buddha and the royal physician of the courts of Rajagriha — received training that encompassed anatomy, surgery, herbal pharmacology, and the full range of Ayurvedic theory alongside philosophical inquiry into the nature of health, disease, and the relationship between physical and mental wellbeing. Charaka, recognized as the foundational theorist of Ayurvedic internal medicine, similarly pursued philosophical inquiry alongside his medical scholarship at Takshashila — reflecting the educational philosophy that the best medical practitioners were those who understood not only what to do but why, grounded in a comprehensive account of the human being as a physical, psychological, and spiritual unity.

Astronomy and mathematics formed a second major pillar of the scientific curriculum at both institutions. Nalanda's curriculum included Ganita (mathematics) and Jyotish (astronomy and astrology), taught alongside other sciences to ensure students understood the numerical relationships underlying natural phenomena. The scholars who worked within Nalanda's intellectual community made contributions to mathematics that reshaped the global intellectual landscape: the development of

the decimal positional number system, the formalization of the concept of zero as a number with its own properties, and substantial advances in trigonometry and algebraic reasoning. Aryabhata — the most celebrated mathematician and astronomer of the Gupta period — is associated with Nalanda or its intellectual environment, and his *Aryabhatiya* (499 CE) demonstrates the level of mathematical sophistication that Nalanda's curriculum both presupposed and generated.

6.3 Philosophy, Logic, and Grammar:

Logic held a uniquely privileged position in Nalanda's curriculum as the only subject that was mandatory for all students regardless of their disciplinary specialization. The Nyaya school's systematic theory of valid inference (involving the four *pramanas*: perception, inference, comparison, and testimony), the Samkhya school's dualistic metaphysics, and the Buddhist epistemological traditions of Dignaga and Dharmakirti (both of whom were associated with Nalanda) constituted a body of logical theory of extraordinary sophistication — one that engages meaningfully with contemporary analytic philosophy and has only recently begun to receive the scholarly attention in Western philosophical circles that it merits.

The study of grammar and linguistics occupied an equally central position. Nalanda taught Sanskrit, Pali, and Prakrit — not merely as languages of instruction but as objects of systematic scholarly inquiry in their own right. Panini's *Ashtadhyayi*, which had been produced within Takshashila's intellectual orbit, established the formal grammar of Sanskrit through a system of approximately four thousand rules that remains one of the most complete and rigorous descriptions of any natural language ever produced — an achievement that structural linguists of the twentieth century recognized as anticipating by two millennia the methods of modern formal linguistics.

6.4 Political Science, Economics, and Military Strategy:

The inclusion of political science (*dandaniti*), economics (*arthashastra*), and military strategy in both universities' curricula reflects an educational philosophy in which the preparation of citizens for public responsibility was regarded as an academic obligation equivalent in importance to the cultivation of philosophical wisdom. Chanakya's composition of the *Arthashastra* within Takshashila's intellectual community represents the most famous example of this tradition: a comprehensive treatise on statecraft, economic policy, military organization, diplomatic strategy, and administrative law that drew on Takshashila's interdisciplinary curriculum to produce a work of breadth and analytical depth that remains a foundational text of Indian political thought.

The military academy dimension of Takshashila's curriculum — covering warfare tactics, fortification design, strategic planning, and the administrative aspects of maintaining armies — reflects the institution's responsiveness to the practical needs of the states and empires within whose political environments its graduates would serve. This practical orientation was not regarded as a compromise of academic seriousness but as its expression: knowledge that could not be applied to the challenges of governance, health, and security was incomplete knowledge. The integration of practical professional preparation with theoretical inquiry — in medicine, in political administration, in military science — is perhaps the ancient universities' most enduring contribution to the philosophy of higher education.

6.5 Nalanda's Six Primary Disciplines: A Model of Structured Integration:

Nalanda's curriculum was organized around six primary disciplinary streams that collectively encompassed the full range of human intellectual endeavour as the ancient Indian tradition understood it:

- (1) Buddhist Studies — covering the three major schools of Mahayana, Hinayana, and Sarvastivada; the *Prajnaparamita* literature; the *Abhidharma* philosophical analysis; and the meditative and ethical traditions that grounded Buddhist practice.
- (2) Logic and Philosophy — the Nyaya and Samkhya schools; Buddhist epistemology; the theory of valid inference; and the practice of dialectical debate that connected all disciplines.
- (3) Grammar and Linguistics — Sanskrit, Pali, and Prakrit as both media of instruction and objects of formal scholarly inquiry; phonetics; morphology; and the interpretive traditions of commentary literature.
- (4) Medicine and Ayurveda — theoretical principles of health and disease; anatomy and physiology; herbal pharmacology; surgery; and the clinical apprenticeship traditions that trained practitioners.

(5) Astronomy and Mathematics — observational astronomy; planetary motion theory; arithmetic; algebra; geometry; and the computational methods used in calendar-making and navigational astronomy.

(6) Arts and Literature — classical Sanskrit poetry and drama; fine arts including sculpture and painting; architecture; and the aesthetic theories that connected artistic practice with philosophical inquiry.

The organizational logic of these six streams is not arbitrary: each stream connects to and depends upon the others. Buddhist studies require logic for philosophical analysis and grammar for textual interpretation. Medicine requires mathematics for measurement and astronomy for seasonal timing of treatments. Arts requires grammar for literary composition and philosophy for aesthetic theory. This web of interdependencies is why Nalanda's curriculum produced scholars of genuine breadth — not merely specialists with superficial acquaintance with adjacent fields, but thinkers for whom the connections between disciplines were as important as the content of each discipline itself.

7. PEDAGOGY AND KNOWLEDGE INTEGRATION: DEBATE, MENTORSHIP, AND EXPERIENCE :

7.1 Shastrartha: The Discipline of Structured Intellectual Debate:

The most distinctive and intellectually significant pedagogical practice of both Takshashila and Nalanda was the Shastrartha — the formal scholarly debate through which students tested and refined their understanding across disciplinary boundaries. The Shastrartha was not a competitive exercise in rhetorical performance but a rigorous epistemological practice: a structured dialogue in which participants were required to articulate and defend a position (siddhanta), acknowledge and engage seriously with opposing views (purvapaksha), and develop well-reasoned counterarguments (uttarapaksha) that advanced the inquiry rather than merely defeating the opponent [42-43]. This methodology — combining genuine respect for opposing perspectives with the commitment to rigorous reasoning and the expectation of intellectual progress through dialogue — is one of the most sophisticated contributions of ancient Indian intellectual culture to the global history of ideas.

At Nalanda, the Shastrartha tradition was institutionalized at a remarkable level of sophistication. The university maintained a network of scholar-debaters whose specific responsibility was to engage visiting scholars in public debate — testing both the visiting scholar's knowledge and Nalanda's own intellectual standards. Xuanzang's account of his own experiences at Nalanda includes detailed descriptions of public debates that could last for days and attracted audiences of hundreds of scholars, with the outcomes shaping both individual reputations and institutional standings in the wider world of Buddhist scholarship. The requirement that all students — regardless of specialization — participate in debates covering the full range of the curriculum ensured that the Shastrartha served its integrative function: the medical student forced to defend a position in Buddhist metaphysics developed connections between medical and philosophical concepts that purely disciplinary instruction would never have generated.

7.2 Mentorship, Apprenticeship, and the Personalization of Learning:

Both Takshashila and Nalanda instantiated forms of personalized, mentorship-based learning that contemporary educational research consistently identifies as among the most effective available. At Takshashila, the relationship between teacher and student was fundamentally personal and voluntarily chosen: students selected their teachers based on scholarly reputation and intellectual affinity, and teachers took responsibility for the complete intellectual development of the students they accepted. This selectivity — operating on both sides of the relationship — created the conditions for the deep trust, intellectual honesty, and sustained engagement that genuine mentorship requires. The student who freely chose a teacher, and who was freely accepted by that teacher, was in a fundamentally different psychological relationship to the learning process than the student assigned to a faculty member by administrative convenience.

At Nalanda, the residential character of the institution enabled mentorship to extend beyond formal instructional hours to encompass the full texture of shared scholarly life. The daily interactions between students and teachers — at meals, in the library, in the meditation hall, during the physical activities that formed part of the institutional routine — created continuous opportunities for the informal transmission of scholarly values, habits of mind, and professional judgment that formal instruction alone cannot convey. The residential mahavihara model was, in effect, a large-scale implementation of

the guru-kula (teacher's household) principle, scaled to accommodate thousands of students while retaining the residential intimacy that made deep mentorship possible.

7.3 Experiential Learning and the Integration of Theory with Practice:

Both institutions embedded experiential learning as a constitutive element of their educational philosophy rather than as an optional supplement to theoretical instruction. At Takshashila, the educational methodology explicitly required that every theoretical subject be accompanied by practical engagement: sciences, arts, and crafts required studying both theory and practice, with every theoretical discussion followed by practical performance. Medical students operated on patients under supervision; astronomical students made their own observations and calculations; military science students participated in tactical exercises; and students of political economy worked through case studies of actual governance problems.

This integration of theory and practice was grounded in a deeper epistemological conviction: that theoretical knowledge divorced from practical engagement is incomplete and potentially misleading. The physician who has read all of Charaka but never examined a patient has not yet grasped what the Charaka Samhita actually says. The astronomer who has mastered Aryabhata's mathematical methods but never observed the night sky has not yet understood what astronomy is. This epistemological position — that genuine knowledge is acquired through the combination of theoretical understanding and experiential engagement, not through theoretical understanding alone — is the ancient Indian equivalent of the pragmatist epistemology that John Dewey developed in the early twentieth century, and its implications for pedagogical design are equally radical.

8. RESEARCH CULTURE, MANUSCRIPT TRADITIONS, AND INTERNATIONAL EXCHANGE :

8.1 Dharmaganja: The World's First Research Library:

The Dharmaganja library complex at Nalanda represents one of the most significant achievements in the history of knowledge organization and preservation, and its design principles deserve careful attention from the perspective of contemporary research library and digital repository architecture. Dharmaganja ("Treasury of Dharma," also known as Dharma Gunj, "Ocean of Dharma") comprised three interconnected structures that served distinct but complementary functions: Ratnasagara (Ocean of Jewels), housing the most valuable manuscripts on philosophy, theology, science, and literature; Ratnodadhi (Sea of Jewels), a nine-story building that preserved Buddhist teachings and philosophy with extensive sutra collections and commentaries; and Ratnaranjaka (Jewel-adorned), housing additional collections of texts spanning the full range of the curriculum [44].

The library's organizational principles were sophisticated. Manuscripts were catalogued and organized according to subject matter, with dedicated scholars maintaining the cataloguing system and ensuring the accurate copying and preservation of texts at risk of deterioration. The choice of palm leaves treated with oil as the primary writing surface — selected for durability in the humid Bihar climate — reflects a practical material intelligence about preservation conditions. The use of soot-based inks that have proven remarkably stable over centuries demonstrates a chemistry of documentation that anticipated the archival concerns of modern manuscript conservation. The regular copying and duplication of important texts — creating redundant copies in different locations as a hedge against loss — reflects an understanding of the risk management principles that modern digital preservation employs through geographical redundancy and multiple backup systems.

8.2 Oral Tradition and the Resilience of Knowledge :

One of the most instructive aspects of ancient Indian knowledge management is the parallel maintenance of oral and written traditions as complementary rather than competing systems of knowledge preservation and transmission. The Vedic oral tradition — which had preserved extraordinarily complex bodies of text with phonemic precision across thousands of years before writing became widespread — demonstrated that the human memory, properly trained and institutionally organized, can be a more reliable medium of knowledge transmission than written records alone. When Bakhtiyar Khilji's forces destroyed Nalanda's library in 1193, the physical manuscripts were lost — but the knowledge those manuscripts encoded was not entirely lost, because

it had simultaneously been preserved in the minds of the scholars who had memorized, internalized, and transmitted it through oral channels.

This insight — that knowledge preservation requires multiple, redundant channels rather than concentration in a single medium — is directly applicable to contemporary concerns about the long-term accessibility of digital knowledge repositories. The concentration of global scholarly publication in a small number of proprietary databases, in formats that require specific software to access and are dependent on commercial institutions for long-term maintenance, recreates the vulnerability that the destruction of Nalanda's library represented. Ancient India's solution — maintaining parallel oral and written traditions, copying important texts in multiple locations, and training scholars to carry knowledge in their memories — is a systems-level response to the fragility of any single preservation medium that modern digital preservation planners are independently rediscovering.

8.3 International Scholarly Exchange: The Ancient Knowledge Network:

The international scholarly networks maintained by both Takshashila and Nalanda were of a scale and institutional sophistication that challenges the assumption that meaningful international academic collaboration is a modern phenomenon enabled by transportation technology and digital communication. Takshashila's student body at its peak included representatives from Babylon, Greece, Arabia, and China — a degree of international diversity that many contemporary universities with explicit internationalization strategies struggle to match. Nalanda's network was even more extensive: students from China, Korea, Japan, Tibet, Mongolia, Sri Lanka, Java, Sumatra, and multiple Southeast Asian kingdoms resided and studied there simultaneously, creating a lived experience of international scholarly community that was sustained not by video conferencing but by the shared experience of residential academic life.

The scholarly exchange activities associated with Nalanda are documented with unusual precision because of the detailed accounts left by Chinese pilgrims. Xuanzang, who studied at Nalanda from approximately 627 to 642 CE, returned to China with 657 Sanskrit texts and 150 relics, transported by twenty horses in five hundred and twenty cases, and spent the remaining decades of his life translating seventy-four texts. This represents a knowledge transfer of extraordinary scope: an entire library of Indian philosophical, scientific, and literary scholarship transferred to China through the medium of one scholar's sustained intellectual labour. Yijing arrived at Nalanda in 673 CE, spent fourteen years in India including ten at Nalanda, and returned with four hundred Sanskrit texts and an equally impressive record of translation work. The monk Dharmadeva from Nalanda journeyed to China in the tenth century and translated numerous texts — part of a sustained multi-century pattern of scholarly mobility that shaped the intellectual landscape of the entire Buddhist world.

8.4 The Five Mahaviharas Network: Ancient Research Consortia:

One of the most significant organizational innovations associated with the Nalanda tradition is the network of five major residential universities — Vikramashila, Nalanda, Somapura, Odantapuri, and Jagaddala — that operated under royal patronage during the Pala dynasty (8th–12th centuries CE) as a coordinated system of higher learning. This network permitted the free movement of scholars between institutions, exposing students to diverse teaching styles and intellectual emphases while maintaining institutional accountability through the shared governance framework of royal supervision. The five Mahaviharas represented, in effect, an ancient equivalent of the modern university consortium — a network of autonomous institutions that collaborated on knowledge creation and scholarly mobility while maintaining their individual institutional identities [45-46].

This model of networked institutional collaboration is directly relevant to contemporary debates about the optimal structure of national and international higher education systems. The argument that a single large university can achieve greater intellectual range and depth than a network of specialized institutions is challenged by the Mahaviharas model: the network's diversity — different institutions emphasizing different disciplinary strengths and different pedagogical approaches — created a system-level intellectual ecosystem richer and more resilient than any single institution could have achieved alone.

9. SYSTEMATIC COMPARATIVE ANALYSIS :

9.1 Takshashila and Nalanda: Complementary Models of the University:

A systematic comparison of Takshashila and Nalanda as institutional models reveals that they represent not competing visions of the university but complementary solutions to the fundamental organizational challenges of higher education — solutions that together anticipate most of the major institutional forms that subsequent higher education history has independently developed. The following table provides a comprehensive multi-dimensional comparison:

Table 3: Comprehensive multi-dimensional comparison

Dimension	Takshashila (6th c. BCE–5th c. CE)	Nalanda (5th c. CE–12th c. CE)
Location & Setting	Decentralized city of learning; Gandhara region (NW of modern Islamabad)	Unified residential campus; Bihar, India
Institutional Model	Dispersed; individual teachers' homes; no lecture halls or dormitories	Centralized residential mahavihara; monasteries, lecture halls, library, dormitories
Founding Period	~600 BCE; flourished under Maurya and Greek rule	~427 CE; founded by Emperor Kumaragupta I of Gupta Empire
Duration	~800 years; destroyed 5th c. CE	~973 years; destroyed 12th c. CE by Bakhtiyar Khilji
Student Population	~10,500 at peak; from Babylon, Greece, Arabia, China	~10,000 students; from China, Korea, Japan, Tibet, Mongolia, Sri Lanka, SE Asia
Faculty	Individual scholar-teachers; reputation-based authority	~2,000 resident teachers; state-supervised
Disciplines	60–68 subjects incl. medicine, law, astronomy, military, philosophy	64 subjects; 6 primary streams: Buddhist studies, logic, grammar, medicine, astronomy, arts
Pedagogy	Individualized apprenticeship; oral discourse; debate	Lectures, discussions, disputations; Shastrartha debates; manuscript scholarship
Language of Instruction	Sanskrit, Pali, Vedic traditions	Sanskrit, Pali, Prakrit; multilingual translation activities
International Exchange	Students from Persia, Greece, Babylon; along Uttarapatha trade route	Xuanzang (627 CE), Yijing (673 CE); scholars to China, Japan, Korea, Java
Library / Documentation	Teacher-held manuscripts; oral tradition	Dharmaganja: 3 buildings; millions of manuscripts; 9-story Ratnodadhi
Notable Alumni/Faculty	Panini (grammar), Chanakya (statecraft), Charaka (medicine), Jivaka (surgery)	Nagarjuna, Vasubandhu, Aryabhata, Dharmakirti, Shantarakshita

Dimension	Takshashila (6th c. BCE–5th c. CE)	Nalanda (5th c. CE–12th c. CE)
Governance	Independent scholar-authorities; market-driven student selection	State-supervised; five Mahaviharas networked under royal patronage
Destruction / Decline	~5th c. CE (Huna invasions; geopolitical disruption)	1193 CE (Bakhtiyar Khilji's invasion); smouldered for months
Legacy	Influenced Greek, Persian, Indian scholarship; prototype for decentralized learning	Shaped Buddhism across Asia; prototype for residential research university

The table 3 reveals a consistent pattern: Takshashila and Nalanda embody complementary institutional models that have remained relevant across two and a half millennia of higher education development. Takshashila's decentralized, market-driven, teacher-autonomous model anticipated the entrepreneurial research university in which faculty reputation and student choice drive intellectual quality. Nalanda's residential, administratively organized, state-patronized model anticipated the residential college system in which the integration of living and learning creates conditions for intellectual community formation. Contemporary higher education has developed both models independently without necessarily recognizing their ancient antecedents.

9.2 Ancient Principles and Their Modern Institutional Equivalents:

The following table maps the principal organizational and pedagogical innovations of Takshashila and Nalanda onto their contemporary institutional equivalents, demonstrating the direct practical relevance of ancient Indian university design to twenty-first-century higher education:

Table 4: Principal organizational and pedagogical innovations of Takshashila and Nalanda

Ancient Principle	Source Institution	Modern Equivalent	Implementation Examples
Multidisciplinary curriculum integration	Both Takshashila & Nalanda	Liberal arts & sciences; interdisciplinary programmes	MIT Media Lab; IIT IKS integration; FLAME University
Mandatory logic and debate	Nalanda (logic required for all)	Critical thinking & communication requirements	Oxford PPE; Harvard Core Curriculum
Residential academic community	Nalanda residential mahavihara	Living-learning communities; residential colleges	Oxbridge colleges; Yale residential system
Merit-based, market-driven faculty selection	Takshashila teacher-scholars	Tenure-track system; research reputation metrics	Global university rankings; H-index metrics
International scholarly mobility	Both (Xuanzang, Yijing; Babylonian, Greek students)	Erasmus, Fulbright, ASEAN exchange programmes	Nalanda University (revival 2014)

Ancient Principle	Source Institution	Modern Equivalent	Implementation Examples
Experiential & debate-based learning	Both (Shastrartha; practical apprenticeship)	Problem-based learning; Socratic seminars; capstone projects	WPI project model; Harvard case method
Manuscript preservation & translation	Nalanda (Dharmaganja; multilingual scholars)	Open access repositories; digital humanities	JSTOR; Project Gutenberg; Google Scholar
Ethics embedded in curriculum	Both (moral formation alongside scholarship)	Professional ethics; research ethics boards	IRB review; Responsible AI frameworks
Networked institutional collaboration	Five Mahaviharas network	University consortia; research alliances	Russell Group; Ivy League; NAAC clusters
State patronage for academic excellence	Gupta Empire support for Nalanda	National research funding; UGC grants	NSF, DST-SERB, ICAR, ICSSR

10. LESSONS FOR THE CONTEMPORARY UNIVERSITY :

10.1 Breaking Disciplinary Silos: The Nalanda Integration Model:

The most urgent lesson that the Takshashila and Nalanda models offer to contemporary higher education is also the one that faces the most powerful institutional resistance: genuine interdisciplinary integration requires structural reform, not merely the addition of interdisciplinary courses to disciplinary programmes. Modern universities operate, as higher education scholars have extensively documented, as decentralized organizations structured around disciplinary departments whose institutional interests — in budget allocation, faculty hiring, student recruitment, and research evaluation — create systematic incentives against the kind of cross-disciplinary collaboration that the stated missions of most universities explicitly endorse.

Nalanda's solution to this problem was structural and mandatory: logic was required of all students regardless of specialization, and the Shastrartha debate tradition required all students to engage intellectually with the full range of the curriculum. The contemporary equivalent — a genuine common intellectual curriculum required of all students, combined with assessment practices that reward multi-perspectival analysis — is widely advocated in higher education reform literature and rarely implemented with the institutional commitment that genuine reform requires. The National Education Policy 2020's mandate for multidisciplinary education at the undergraduate level, combined with the four-year undergraduate programme's structure allowing students to combine major and minor subjects across traditional disciplinary boundaries, represents the most significant step toward Nalanda-model curricular integration in Indian higher education in the modern era.

10.2 Restoring Debate and Dialectics as the Core Pedagogical Method:

The Shastrartha tradition represents ancient Indian higher education's most distinctive and most practically valuable pedagogical contribution — and one whose contemporary recovery is both feasible and urgent. Research in educational psychology consistently demonstrates that active learning methods that require students to generate, defend, and revise their own understanding produce deeper, more durable, and more transferable learning than passive reception of transmitted content. The lecture — still the dominant pedagogical format in most university teaching — is, by these standards, one of the least effective methods available for the development of the competences that employers and society most value in university graduates: critical thinking, independent judgment, communication under pressure, and the capacity to engage constructively with positions that differ from one's own.

Restoring structured debate — the Shastrartha in its contemporary adaptation — to the centre of university pedagogy requires both curricular redesign and faculty development. Courses that require

students to research, present, defend, and critically engage with opposing positions develop exactly the competences that the Shastrartha tradition cultivated: rigorously argued positions, genuine engagement with counterarguments, and the intellectual humility to revise one's understanding in light of good arguments. These are not supplementary soft skills but the core intellectual competences of educated persons — and Nalanda's insistence that they be developed in all students regardless of specialization reflects an educational philosophy that contemporary universities would be well served to recover.

10.3 Building International Scholarly Communities:

The international dimension of both Takshashila and Nalanda's intellectual communities was not an add-on to their domestic educational missions but a constitutive element of their intellectual vitality. The encounter between the Indian Ayurvedic tradition and Greek medical knowledge at Takshashila, between Indian Buddhist epistemology and Chinese religious philosophy at Nalanda, between Sanskrit mathematical traditions and the astronomical traditions of multiple Asian cultures — these intellectual encounters generated insights and syntheses that no single tradition could have produced alone. The international diversity of the student and faculty communities was, in effect, a research infrastructure: it created the conditions for the productive collision of different assumptions, methods, and frameworks that is the engine of genuine intellectual progress.

Contemporary universities' internationalization strategies — focused primarily on international student recruitment as a revenue source and international rankings as a reputational metric — capture the form of internationalization without its substance. Genuine international scholarly community requires the kind of sustained residential co-presence and shared intellectual engagement that characterized Nalanda's student community: students from China, Tibet, Japan, and Southeast Asia who lived, studied, debated, and ate together for years, not students who complete online modules from different countries or attend brief summer schools. The revival of Nalanda University (2014) — deliberately designed as an international residential university on the model of the ancient institution, drawing students and faculty from across Asia — represents the most ambitious contemporary attempt to recover this model.

10.4 Integrating Ethical Formation with Academic Excellence:

Both Takshashila and Nalanda embedded ethical formation within the academic curriculum as a matter of philosophical conviction rather than institutional compliance. Students developed good character, self-control, humility, and respect for knowledge alongside subject mastery — not in separate ethics courses but through the texture of the entire educational environment: the Shastrartha tradition's requirement of intellectual honesty, the residential community's cultivation of shared values, the mentorship relationship's modelling of scholarly integrity, and the curriculum's insistence on understanding the ethical implications of every field of knowledge.

The contemporary university's approach to ethics — primarily through standalone ethics courses, research ethics board oversight, and professional codes of conduct — addresses the compliance dimension of ethical formation while leaving largely unaddressed the character formation dimension that both ancient institutions understood as the deeper educational task. Research ethics boards ensure that researchers do not violate established rules; they do not cultivate the intellectual virtue of genuine concern for research participants' welfare that makes rule-following unnecessary. The ancient universities' insight — that ethical formation requires the entire educational environment, not merely dedicated ethical instruction — is as valid today as it was in the age of Nalanda [47].

10.5 Oral Tradition and the Resilience of Knowledge Systems:

The ancient Indian universities' maintenance of oral tradition alongside written and, eventually, manuscript-based knowledge preservation reflects a systems-level wisdom about the resilience of knowledge that contemporary digital knowledge management is independently rediscovering. The concentration of global scholarly publication in a small number of proprietary databases and digital repositories — accessible only through institutional subscriptions, encoded in formats requiring specific software, and dependent on commercial institutions for long-term maintenance — recreates in digital form exactly the vulnerability that the destruction of Nalanda's library represented in physical form.

The UNESCO mandate for open access publication, the growth of institutional repositories, and the development of distributed digital preservation standards all reflect a recognition that knowledge

preservation requires redundancy, diversity of medium, and independence from any single institutional custodian. The ancient Indian solution — training scholars to carry knowledge in their memories, maintaining multiple manuscript copies in different locations, and preserving oral alongside written traditions — is philosophically analogous to the distributed, open-access, redundant preservation systems that contemporary digital preservation advocates champion. The lesson travels across the millennia with its practical force undiminished.

11. POLICY IMPLICATIONS: NEP 2020, THE NALANDA REVIVAL, AND IKS INTEGRATION :

11.1 The National Education Policy 2020 as a Framework for Recovery:

The National Education Policy 2020 represents the most comprehensive and philosophically ambitious reimagining of India's educational system since independence, and its explicit incorporation of Indian Knowledge Systems as a curricular and research priority creates the institutional framework within which the educational legacy of Takshashila and Nalanda can be substantively recovered and applied to contemporary higher education. NEP 2020's mandates — for multidisciplinary undergraduate education, for the integration of IKS content across disciplines, for the development of research in Indian classical knowledge traditions, and for the strengthening of India's position as a global centre of higher learning — are, at their philosophical core, applications of the educational principles that Takshashila and Nalanda embodied [48-49].

The policy's four-year undergraduate programme, with its provisions for major-minor combinations across disciplinary boundaries and its emphasis on research orientation from the earliest years of undergraduate study, directly reflects the multidisciplinary curricular integration that both ancient universities practised as foundational educational principle. The policy's advocacy for experiential learning, internship, and community engagement as credit-bearing components of degree programmes reflects the ancient universities' integration of theory with practice. And the policy's emphasis on ethical and value education as dimensions of the academic curriculum rather than mere supplementary activities reflects the ancient tradition's understanding of moral formation as inseparable from intellectual development [50-51].

11.2 The Revival of Nalanda University: Promise and Challenge:

The establishment of the revived Nalanda University (2014) at a new campus near the original site in Bihar represents one of the most symbolically significant acts of cultural recovery in contemporary Indian higher education policy. Conceived as an international residential university on the model of the ancient institution, drawing students and faculty from across Asia and committed to multidisciplinary, research-oriented education, the revived Nalanda embodies a genuine attempt to recover the educational philosophy that made its ancient namesake a global intellectual centre for nearly a thousand years. The East Asia Summit's endorsement of the revival project as an initiative of pan-Asian cultural significance reflects the recognition that the original Nalanda was not merely an Indian institution but an Asian and indeed global intellectual heritage.

The practical challenges facing the revived Nalanda — adequate funding, faculty recruitment in a competitive global market for academic talent, the development of research infrastructure commensurate with its ambitions, and the cultivation of the institutional culture that made the ancient university distinctive — are substantial. The lesson that both ancient institutions teach most clearly is that a university's intellectual quality is not primarily a function of its physical infrastructure but of the quality of the intellectual community it houses and the robustness of the pedagogical culture it sustains. The revived Nalanda's ability to recover the Shastrartha tradition as a living pedagogical practice, to build a genuinely international residential scholarly community, and to integrate disciplinary knowledge through shared intellectual requirements — rather than merely offering interdisciplinary courses alongside conventional disciplinary programmes — will determine whether the revival achieves its ambitious cultural and intellectual aspirations.

11.3 IKS Integration in Management and Professional Education:

Beyond the revived Nalanda and the general IKS curriculum mandate, the educational legacy of Takshashila and Nalanda has specific implications for management and professional education in India. The Arthashastra's origins in Takshashila's curriculum, the Ayurvedic medical tradition's roots in both

institutions, and the administrative and governance traditions that both universities developed and transmitted — all represent bodies of knowledge with direct relevance to management education, public health education, legal education, and public policy education. Indian management schools, medical schools, and law schools have an opportunity — and under NEP 2020, an obligation — to develop curriculum content that draws substantively on these traditions, creating educational programmes that are simultaneously internationally competitive and distinctively rooted in India's own intellectual heritage.

12. CONCLUSION :

This research paper has undertaken a comprehensive, multi-dimensional scholarly examination of Takshashila and Nalanda as historical models of the multidisciplinary research university, tracing their origins, analysing their curricula and pedagogies, investigating their research cultures and international networks, and developing detailed lessons for the contemporary academy. The analysis has generated several conclusions of significance for higher education theory, history, and policy.

The first and most fundamental conclusion is that multidisciplinary research and integrated education are not modern innovations but ancient achievements — achievements of extraordinary sophistication and sustained institutional success. Takshashila and Nalanda proved, across a combined institutional history of nearly two millennia, that knowledge is most productively pursued across disciplinary boundaries, that scholars form their deepest and most durable intellectual commitments through residential community, that genuine understanding requires both theoretical mastery and practical engagement, and that international scholarly diversity is an intellectual resource of the first order. These are not historical curiosities but validated educational principles with direct application to the challenges of contemporary higher education.

The second conclusion concerns the specific contributions of each institution to the history of the university. Takshashila's decentralized, market-driven, scholar-autonomous model pioneered the entrepreneurial, reputation-based organization of academic excellence that the most productive contemporary research universities embody. Nalanda's residential, administratively organized, state-patronized model pioneered the residential college system, the organized research library, the international scholarly exchange network, and the integrated multidisciplinary curriculum that the world's most celebrated universities aspire to. Together, they constitute a body of institutional design knowledge that the global history of the university has not yet adequately acknowledged or assimilated. The third conclusion concerns the specific pedagogical legacy of the Shastrartha tradition. The ancient Indian practice of structured scholarly debate — requiring rigorous argument, genuine engagement with opposing views, and the intellectual humility to revise positions in light of good reasons — is the single most powerful pedagogical practice available for developing the intellectual competences that higher education most needs to cultivate. Its recovery as the central pedagogical method of the university, displacing the passive lecture as the dominant educational format, would represent the most significant pedagogical advance available to contemporary higher education — and it requires no new technology, no additional funding, and no institutional innovation. It requires only the intellectual courage to take the ancient Indian educational tradition seriously on its own terms.

The fourth conclusion concerns policy. The National Education Policy 2020's mandates for multidisciplinary education, Indian Knowledge Systems integration, and the strengthening of India's position as a global centre of higher learning are not merely administrative prescriptions but expressions of a deeper cultural commitment to recovering and renewing the educational legacy that Takshashila and Nalanda represent. The revival of Nalanda University, the IKS curriculum development initiatives, and the four-year undergraduate programme reform are steps in this direction. Their success will depend on whether the institutions that implement them understand the philosophical principles that made the original universities great — and have the institutional courage to implement those principles with the same conviction that Chandragupta's court brought to the support of Takshashila and the Gupta emperors brought to the establishment of Nalanda.

Ultimately, the story of Takshashila and Nalanda is a story about what universities are for. They existed not to credential specialists but to form whole human beings — scholars who were simultaneously rigorous in their disciplines and broad in their intellectual sympathies, practically competent and philosophically grounded, internationally connected and deeply rooted in their own civilizational traditions, and committed to the use of their knowledge in the service of human welfare and social

flourishing. These are goals that the contemporary university states but struggles to achieve. The ancient universities achieved them — imperfectly, with the limitations of their historical contexts, but genuinely and sustainably — across a combined institutional history of nearly two thousand years. Their legacy is not a burden of nostalgia but a resource of enduring practical wisdom for the renewal of higher education in our own time.

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