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TRADITION, TECHNOLOGY AND TRANSFORMATION: INDIAN KNOWLEDGE SYSTEMS IN HIGHER EDUCATION

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ABSTRACT

Higher education is a place where diverse perspectives of viewing the world bloom. Several higher education institutions in India are incorporating Indian Knowledge Systems (IKS) into their curricula at undergraduate and postgraduate level as per the recommendation of NEP 2020 and guidelines of UGC. This involves incorporating traditional disciplines and wisdom in the curricula to provide a holistic and culturally grounded education. Higher education in the digital age faces the challenge of equipping students with relevant skills and fostering holistic development. Currently, Indian higher education is expanding rapidly. With the growing population, technological advancements can be leveraged to address the challenge of accessibility, equity and inclusivity. This paper addresses the transformative potential of IKS integration in the era of digital advancements, challenges upfront and recommendations to meet the overall objectives of higher education . The paper also reflects upon the potential of the digital ecosystem to bridge the gap between the diversity of learners in India, strategies for harnessing the power of AI to channelize the integration, potential of IKS in enriching content and fostering cultural sensitivity through the lens of relevant case studies.

Keywords: Indian knowledge systems, higher education, digital age, holistic development

INTRODUCTION

Education in India is deeply embedded in its ancient philosophical tradition, where Vidya was seen not merely as the accumulation of knowledge but as the means for holistic self-empowerment. In the ancient Indian texts, it is said that “The wealth of knowledge is indeed the supreme among all forms of wealth.” Over the years, India has strived to nurture and pass on this invaluable wealth of knowledge to its youth**.** In the last decade, India has seen a 318% increase in its representation in global rankings—the highest growth among the G20 nations highlighting the positive leap in Higher Education (Ministry of Education, 2025). Higher education in India is undergoing rapid transformation by technological advancements and there is a growing emphasis on holistic development. While embracing digital tools and global perspectives, there is a renewed interest in drawing upon the rich heritage of the Indian Knowledge System (IKS) to create a more relevant, engaging, and culturally rooted learning experience. The IKS is a vast body of knowledge spanning diverse fields, including mathematics, astronomy, medicine, philosophy, arts, and sustainable practices. Integrating IKS into the curriculum offers the potential to foster critical thinking, ethical reasoning, and an appreciation for India's intellectual contributions to the world (Mohanty, 2016). This paper explores the transforming potential of IKS in higher education in the digital age. It highlights the need and inherent strengths of IKS, analyzes the current landscape of digital initiatives in Indian higher education and explores the existing examples and opportunities for integration of IKS with modern technologies, underlying challenges and recommendations.

BACKGROUND: INDIAN KNOWLEDGE SYSTEMS

The Indian Knowledge System (IKS) is not merely a collection of historical facts or ancient texts; it is a dynamic and evolving body of knowledge developed and refined over centuries. As per National Education Policy 2020, it is characterized by holistic perspective, emphasis on practical application ,ethical foundation, experiential learning, sustainability, plurality of perspectives. It is a corpus of literary and non literary sources (oral traditions) in various fields like science, engineering, architecture, alchemy, aesthetics, folklore, tribal wisdom (Mahadevan et al., 2022). 'Indian' implies the indigenous sources of knowledge generated by the Indian society of Akhand Bharat, the undivided Indian subcontinent spanning from Burma to Afghanistan and from The Himalayas to The Indian Ocean . 'Knowledge' is what emanates from the wisdom and insights out of deep experiences,observation,experimentation, analysis, validated, improved and augmented (Mahadevan et al., 2022). There is a whole established mechanism for valid knowledge which is Pramāṇaśāstra ' which gives insight into how a knowledge is made valid. 'Systems' is a structured methodology and classification to access the available corpus of knowledge. Hence Indian Knowledge Systems is a structured corpus of all the wisdom and insights spanning various disciplines of knowledge originating in the Indian subcontinent since time immemorial.

NEED OF INDIAN KNOWLEDGE SYSTEMS IN THIS ERA

Every society has its wisdom gathered through ages. The issues of government, business, and society have always existed in every civilisation which were addressed by the wisdom they had at that time. Tribal communities have been the example of sustainable living. Therefore it is important to have a certain continuity of how thoughts have flourished over time. Though it is important to know how an aircraft is made, it is equally important to know how many ideas were first in progress before it took a concrete shape. The forthcoming years will be about intellectual property rights. The world intellectual property organization will decide who will be benefited with money on some knowledge by claiming rights. US company was awarded the fiirst patent for neem as a pesticide , the knowledge every farmer of India knew. There was no defense because of lack of evidence based knowledge which could have been taken from Indian scriptures on herbs. Hence the patent was lost (Mahadevan et al., 2022). CSIR fought for revoking the patent for turmeric (Mahadevan et al., 2022). The traditional knowledge of potent herbs getting patented by other nations is a threat to the parent Nation's economy. Hence it is important to know the nature of contributions made by the Indians to the systems of knowledge (Mahadevan et al., 2022). India was known for 'wootz' steel in 700 BCE. It was a unique process of making steel and swords made out of it were exported to other countries. The product was the finest at that time. The knowledge was lost with time. Michael Faraday tried to replicate it but could not (Ranganathan & Srinivasan, 2006). The texts on metallurgy like Rasratnasamuchchaya mentions of different types of iron ores. These are some examples highlighting the need to reflect on wealth of knowledge since ages. A country flourishes on it's natural resources and wealth of knowledge. Hence for economic security, national pride and protecting the intellectual property, it is important to be aware of the Indian Knowledge Systems.

STATUS QUO OF HIGHER EDUCATION IN INDIA

India's higher education sector has seen growth, with significant increases in enrollment, expanded State Public Universities (SPUs), and improved representation of disadvantaged groups. As per AISHE data (All India Survey of Higher Education), there are 1326 Universities, 52690 College , 16416 Standalone Colleges, 99 R&D institutes , more than 100 Institutes of National Importance, 20 AIIMS, 23 IITs, 21 IIMs in India. There is a significant

rise in enrolment of students in higher education . it has increased by 26.5% from 2015-2022. The country has made strides in gender parity, faculty development, and global research contributions. With the National Education Policy (NEP) 2020, India aims for a Gross Enrollment Ratio (GER) of 50% by 2035, focusing on further strengthening education infrastructure, faculty, and research to ensure equitable access to quality education.

STATUS QUO OF DIGITAL INITIATIVES IN HIGHER EDUCATION IN INDIA

The Ministry of Education (MoE), Government of India, has launched numerous initiatives to promote digital learning and innovation in higher education through National Mission on Educatiom through Information and Communication Technology (NMEICT). The initiatives include SWAYAM (Study Webs of Active-Learning for Young Aspiring Minds), National Digital Library of India (NDLI), National Programme on Technology Enhanced Learning (NPTEL), FOSSEE (Free/Libre and Open Source Software) , National Educational Adaptive Technology (NEAT) is an AI adaptive learning portal that uses AI to adapt and personalize learning experience according to the needs of the learners. The nation has come up with the National Strategy for Artificial Intelligence (NSAI) focusing on AI interventions in the field of Education, Agriculture and healthcare. The strategy paves a vision of a balanced approach to leverage AI for both national needs and global contributions. Blended learning, flipped classrooms are some of the pedagogical approaches emerging from the digital ecosystem(Chawla,2024).

STATUS QUO OF INTEGRATION OF IKS IN HIGHER EDUCATION IN THE DIGITAL AGE

The integration of IKS into higher education in the digital age is gaining momentum. As per UGC guidelines on integrating IKS in Undergraduate and postgraduate level, several institutions are leading the way by incorporating courses on IKS. The integration is summarized as:

1. **Designing curriculum and courses:** This includes integrating IKS in existing disciplines, developing separate courses on IKS, developing Online courses and modules to introduce students to various aspects of IKS, such as Indian philosophy, mathematics, medicine, and arts (Sharma, 2022).
2. **Digital repositories and resources :** National Digital Library, IKS repository are the place to access digitized texts. Yaksha prashna is a digital platform to promote and preserve IKS. Digital resources such as e-books, videos, and interactive simulations can be created to enhance the learning experience and make IKS more accessible to students (Gupta, 2023). Technology can be used to document, preserve, and disseminate traditional knowledge from various IKS traditions (Singh, 2020).
3. **Pedagogy :** Gamified Learning can make learning joyful and lasting. Incorporating the principles of IKS within interactive games can enhance student engagement and understanding of complex concepts (Agarwal, 2023). Blended learning, flipped classrooms , project based learning, inquiry based learning along with traditional practices can be leveraged according to the need of the course and the learners.
4. **Research and Innovation :** Several IKS research centres known as Gaveshana have been established across Indian Universities. Virtual labs and simulations can provide an interactive and accessible learning environment. Post Doctoral fellowships are in place to promote research in the field of IKS in higher education.

5. **AI-powered tools to ensure flexibility and adaptability:** In the field of education AI can cater to individual student learning styles and paces, offering customized educational content. In agriculture, Agricultural technology (AgTech) startups are utilizing AI and machine learning for tasks such as crop monitoring and yield prediction. (Kumar et al., n.d.). AI is also resolving the healthcare problems by early detection of disease, diagnosis, decision making, research (Kumar et al., n.d.)

Examples exploring the integration of Indian Knowledge Systems in higher education

IIT Gandhinagar - Exploring Indian Culture through Projects & Electives

1. **Integration Strategy:** IIT Gandhinagar has integrated IKS through elective courses like "Introduction to Indian Philosophy," "Science and Technology in Ancient India," and project-based courses that encourage students to explore and implement traditional Indian design principles in modern engineering solutions. They also offer courses on Indian art, literature, and history, fostering a holistic understanding of Indian culture every year.
2. **Curriculum & Pedagogy Transformation:** The electives broaden the students' perspective beyond core engineering principles. Project-based learning encourages critical thinking, problem-solving, and the application of ancient wisdom to contemporary challenges. The pedagogy emphasizes experiential learning, discussions, and presentations that encourage active engagement with IKS concepts. For example, students might research and develop sustainable water management systems inspired by ancient Indian techniques like stepwells.
3. **Societal Impact & Learner Outcomes:** Graduates develop a deeper appreciation for their cultural heritage. They are often more empathetic designers and engineers, understanding the social context of their work. The project-based approach fosters innovation rooted in Indian wisdom, potentially leading to sustainable and culturally relevant solutions for societal challenges in sectors like water management, agriculture, and energy. Students report a greater sense of purpose and connection to their roots. (*IKS: Exploring India's Knowledge Traditions | IITGN News*, n.d.)

IIT Mandi: Course on Introduction to consciousness and wellbeing

1. **Integration Strategy and pedagogy :** This is a separate course that explores human consciousness and its possibility through sutras from Indian scripture,books of Indian saints, latest scientific study from neuroscience and psychology. This course emphasizes not only learning academic knowledge, but practically experiencing and exploring one's inner dimension Consciousness and Wellbeing. This course includes how to make one to reach peak performance, use the full potential of the brain`s hidden potentials and abilities.
2. **Societal impact and learning outcome:** Study of consciousness is a worldwide attention deeply related to the Artificial Intelligence project and neuroscience. It holds a key to overcoming depression and mental issues.Most importantly,how human beings can reach eternal happiness is also included. (https://wing.iitmandi.ac.in/, n.d.)

TRANSFORMATIVE POTENTIAL OF IKS IN HIGHER EDUCATION

Transformation reflects when changes occur at grassroot level. Curriculum and pedagogy are the roots of an educational system which affect learning experiences. This section reflects on the transformative potential and consequently the challenges in three dimensions : curriculum, pedagogy and learning experiences.

The strength of IKS lies in its multidimensional perspective.The entire knowledge in IKS is concise and specific because it was supposed to be transmitted orally and committed to one's memory. So, a verse can be found which is a work on Mathematics and also displays poetry and philosophy along with the mathematical concept. Nyaya is a philosophical school of thought , it discusses logic, argumentation and valid means of knowledge as well (Mahadevan et al., 2022). Kautilya's Arthaśāstra is a pioneer in the field of politics and foreign policy. It has an elaborative description of administrative machinery with even the details on the salary to be paid at each level. Suśrutasaṃhitā has mentioned the fabrication of more than 100 surgical tools made of iron-carbon alloys implying a brilliant existence of alloy technology, metals and metalworking. The concise Sūtras and Sub-Sūtras mentioned in Vedic Mathematics have been utilised well by various industries teaching quick calculations. Vedic Mathematics find applications in digital signal processing, chip designing and many more (Kumar, 2024). It is evident that IKS has a lot of knowledge and wisdom to offer in different disciplines which on integration can enrich the curriculum and develop a different perspective of looking at real world problems.

Transacting such a curriculum would require innovative pedagogical approaches. Ancient system of knowledge has space for dialogue and discussion as evident from various philosophical schools of knowledge. Engaging students in argumentative discussions, using contextualised Indigenous instructional materials, working with Indigenous knowledge keepers and elders, traditional teaching practices, blended learning, experiential learning, interactive digital modules, connecting with nature, community engagement, inquiry based learning can enhance the overall experience of a learner. Integrating IKS into higher education has the potential to transform the learning experience by enhancing critical thinking and problem-solving (Sinha, 2019), promoting ethical leadership (Chakrabarti, 2017), fostering innovation and creativity (Kumar, 2021). Cultivating a Holistic Understanding of the World (Nanda, 2015), strengthening cultural identity and global citizenship (Jain, 2020), promoting sustainable development (Bhardwaj et al, 2022). Technology which is now revolutinized by AI hence can reduce the number of repetitive, time-consuming duties a teacher undertake in a classroom (Haleem et al., 2022) Learners can go places with a digital tool in their hands, can have expertise of subject matter experts , adapting according to their learning styles (Haleem et al., 2022). Hence technology is there to amplify and augment the human intelligence, not to replace it.

CHALLENGES AND RECOMMENDATIONS

Integrating IKS into higher education in the digital age presents several challenges. Lack of Awareness and Understanding of educators and students is a prominent challenge (Mohanty, 2016). Some educators may be resistant to incorporating IKS into their teaching practices due to concerns about its relevance or credibility (Chakrabarti, 2017). There may be a lack of resources, such as qualified faculty, relevant textbooks, and digital materials, to support IKS integration (Kumar, 2021). Ensuring the authenticity and accuracy of IKS content while adapting it for modern educational standards is a significant challenge (Nanda, 2015). The content available on IKS is multilinguistic, translation without losing on real essence is a significant challenge.

Skepticism is prevailing as IKS is seen as more of religious knowledge. However it is more of literary and non literary knowledge passed on to generations since ages. Overcoming skepticism about the relevance of IKS in the modern world requires showcasing successful case studies and demonstrating its practical applications.

To address these challenges, the following recommendations are proposed:

1. Raising Awareness and Promoting Understanding: Workshops, seminars, and training programs can be organized to raise awareness and promote understanding of IKS among educators and students (Sharma, 2022).
2. Developing Curriculum and Resources: Curriculum and resources can be developed to support IKS integration, including textbooks, digital materials, and online courses (Gupta, 2023).
3. Providing Faculty Development: Faculty development programs can be offered to equip educators with the knowledge and skills needed to effectively integrate IKS into their teaching practices (Verma, 2021).
4. Establishing a Robust Validation System: Development of a structured, peer-reviewed validation process will ensure that all materials relating to IKS are accurate and consistent with the spirit of the IKS (Agarwal, 2023).
5. Promoting Interdisciplinary Collaboration: Encouraging collaboration between experts in IKS and experts in modern disciplines can help to bridge the gap between traditional knowledge and contemporary knowledge systems (Agrawal, 2018).
6. Governmental Support and Funding: Increased governmental support and funding for IKS-related research, education, and infrastructure will be essential for its sustained integration in the higher education system. (Bhardwaj et al, 2022).

CONCLUSION

Higher education is a place where everything is explored with diverse perspectives. It is a place of exploration and synthesisation of knowledge. Several untouched works on different fields of engineering, architecture, science, arts, astronomy, are lying in Indian Knowledge Systems. IKS doesn't stop at Kautilya's Arthaśāstra and Patanjali's yogasutras, it is also about works like Rasa Ratna Samuccaya on Metallurgy, Mayamuni's Mayamata on Architecture, Bhoja's Yukti Kalpataru on Ship Building. Strength of IKS lies in its multidimensional perspective. A single sutra can explore Mathematics, poetry and philosophy at the same time.

Hence it is imperative to explore the available knowledge and wisdom to enhance the existing curriculums, boost research and innovation, protecting intellectual property and ensuring economic security. By fostering a deeper understanding of Indian culture, ethics, and values, the programs on IKS would empower students to contribute meaningfully to society, develop innovative solutions to contemporary challenges, and revitalise traditional knowledge systems. Digital ecosystem is a powerful tool to disseminate knowledge and ensure accessibility, equity and inclusivity. It amplifies and augments human intelligence when used selectively . Its power can be harnessed in the form of developing courses, modules, AI can be used to leverage content in various languages as per the pace and requirement of the learners. It has the power to ensure flexibility, adaptability, engaging learning experience and hence bridging the gap between tradition and technology.

As more institutions embrace IKS, we can expect to see a more culturally grounded and ethically driven generation of professionals shaping the future of India and the world. The key lies in ensuring rigorous academic standards, effective teacher training, and a commitment to bridging the gap between traditional wisdom and modern advancements. Most of the big IT companies are spending lots of money and doing a lot of studies on the science of happiness through the support of technology. But still it is at an infant level. We

have everything available right now, but still people are looking for meaning of life. Sustainable living is still a challenge. The aim of education is the holistic development of an individual and wisdom from Indian Knowledge Systems owing to its multifaceted nature will contribute in achieving the aim.

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