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Perspective

Indian Knowledge System: Perspectives on Integration in the Higher Education System

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ABSTRACT

The Indian Knowledge System (IKS) includes the applicability of applied science, economics, astronomy, disease-curing, music, arts, social culture etc., and is one of the oldest and most detailed intellectual traditions in the world. The oldest sources of Indian knowledge are the Vedas that give the key paradigm of the spiritual, philosophical, and scientific inquiry. Knowledge has always been considered to be the decisive benefit that is utilized for the beneficial works to serve mankind since prehistoric times. The review highlights the multidisciplinary facets of IKS and its modern aspects in the Higher Education System.

1. Introduction

The Indian Knowledge System (IKS) is a very extensive intellectual tradition that has played an enormous role in the establishment of basic sciences like mathematics, astronomy, physics, chemistry and life sciences. Many of the ancient Indian thinkers had evolved advanced theories regarding numbers, algebra, astronomy, metallurgy, medicine and ecological equilibrium, way before the advent of the modernistic scientific systems. Such contributions were recorded in the classical texts, such as the Vedas, the Upanishads, the Sulbasutras and other treatises authored by other scholars like Aryabhata, Bhaskara, Charaka and Sushruta [1-3]. The Indian Knowledge System is a holistic tradition of science as it incorporates empirical observation, philosophical reasoning, and practical applications. Over the last few years, one may observe a revival in the idea of reconsidering these old systems of knowledge to learn how they can be applied in modern scientific studies and education. This review describes significant contributions of the Indian Knowledge System to basic sciences (mathematics, astronomy, chemistry, metallurgy, and life sciences) [2-5]. It also talks about scientific methodologies found in the ancient Indian literature and how the ideas of these methods apply to interdisciplinary research nowadays. Knowing the scientific premises of the Indian Knowledge System may assist in reconciling the traditional wisdom with modern science towards sustainable development and innovation.

The Indian Knowledge System (IKS) is a broad collection of knowledge that was created in the Indian subcontinent over thousands of years. This body of knowledge is a broad field and includes areas of philosophy, mathematics, astronomy, medicine, agriculture, architecture, linguistics, and environmental science. With the help of systematic observation, logical thinking, and experimentation, ancient Indian scholars have contributed to the formation of the basic rules of science. The Indian Knowledge System has a holistic approach to knowledge, unlike the contemporary discipline of science, which tends to separate knowledge into various special areas. Scientific concepts were commonly infused into a religious and philosophical framework, but most of these concepts reveal startling empirical accuracy and mathematical precision. Some of the ancient Indian literature holds useful information which was associated with scientific knowledge (Fig. 1). Indicatively, the Vedas, Upanishads, Sulbasutras, Aryabhatiya, and Charaka Samhita contain the discussion on mathematical concepts, astronomical observations, medical practices and natural phenomena. Through these readings, it becomes clear that ancient Indian scholars were more highly developed in the field of geometry, number systems, planetary movement, metallurgy and biological sciences. Indian scholars like Aryabhata, Brahmagupta, Bhaskara II, Sushruta and Charaka had a significant influence on the evolution of scientific philosophy (Fig. 1) [2-4]. Their exchange of knowledge with the Arab world and later Europe during the medieval period had a great influence on the scientific traditions of other civilizations and many of their ideas found their way there. Scholars and policymakers in the past decades have stressed the significance of applying the traditional knowledge systems along with contemporary scientific education. The resurgence of the Indian Knowledge System is also an effort to find the scientific knowledge available in ancient times and look into its possible use in modern research, sustainability, and technological development. This review discusses the key contributions the Indian Knowledge

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System made to the basic sciences and mathematics, astronomy, chemistry, metallurgy, and life sciences. It also gives emphasis on the scientific approach that was inherent in the ancient Indian knowledge traditions.

Figure 1: Illustration of the Indian Knowledge System (IKS) applicability in Ancient India.

2. Contributions to Mathematics

Mathematics is one of the most prominent contributions of the Indian Knowledge System to the development of world science. Early Indian mathematicians were the earliest to discover number theory, algebra, geometry and trigonometry. Aryabhata (476 CE) contributed a lot to trigonometry and algebra. He created the concept of sine functions in his Aryabhatiaya and gave correct astronomical computations. These ideas were later extended by other mathematicians like Brahmagupta and Bhaskara II, who devised ways of solving quadratic equations and arithmetic progressions. Probably one of the most important contributions made by Indian mathematics is the concept of zero and the decimal number system. Zero and its operation were first defined by the Hindu astronomer and mathematician. Brahmagupta in 628 CE [6]. The invention of the place-value system enabled the effective representation of huge numbers and complicated mathematical operations. This system was later brought to the Arab world, which then spread to Europe, where it formed the basis of modern arithmetic. Vedic altar construction. Geometric constructions as described in the Sulbasutras, c. 800-500 BCE, were used to construct Vedic altars. These texts contain techniques to draw squares, rectangles, and circles and approximations of the square root of two. Other scholars believe that these texts have early forms of the Pythagorean theorem. These mathematical inventions heavily impacted the evolution of scientific thinking throughout the world, and they still form the foundation of modern mathematical systems.

3. Contributions to Astronomy

Aryabhata also hypothesized the rotation of the Earth on its axis, and this caused the observed movement of the stars in the sky. This concept was a challenge to previous geocentric interpretations and was a sign of an advanced knowledge of celestial mechanics. One more well-developed area of ancient India was astronomy. Indian astronomers made a good study on the motion of the planets, eclipses and celestial cycles. These observations were frequently compiled as astronomical treatises called Siddhantas. The Indian astronomers also arrived at the correct ways of determining the positions of the planets and determining the solar and lunar eclipses. One of the most significant astronomical books, Surya Siddhanta, provides a detailed description of planetary orbits, the measure of time and trigonometric formulas which were used in astronomical observations. Besides the theory of astronomy, Indian scholars invented useful astronomical devices to tell time and the positions of stars. These tools were subsequently perfected in the medieval era, especially in the astronomic observatories established by Maharaja Jai Singh II in the eighteenth century. Indian astronomers made numerous contributions to the traditions of astronomy in the Islamic world, which eventually passed this knowledge to Europe during the Renaissance.

4. Contributions to Metallurgy

Distillation was also among the earliest methods of producing zinc, which was later done in India. Archaeological findings in India at the Zawar mines of Rajasthan have shown that a vast production of zinc was being done in the country centuries before it was recorded in Europe. These metallurgical accomplishments signify the empirical and experimental methods taken by ancient Indian intellectuals and craftsmen in their investigation of materials and chemical operations. Early chemistry and metallurgy also greatly contributed to ancient India. The chemical knowledge of the Indian tradition was usually equated with Rasashastra, a part of the study that dealt with metals, mineral and chemical processes. The metallurgists in India came up with sophisticated methods of mining and refining metals, including iron, copper, zinc, and gold. The Iron Pillar of Delhi is one of the most renowned relics of Indian metallurgical skill in the Indian subcontinent, dating back over 1600 years and has not corroded at all. The pillar shows the great degree of metallurgical skills that were held by Indian craftsmen in ancient times.

5. Perspectives of Integration of IKS in the Higher Education System

The National Education Policy (NEP) 2020 is a major landslide in the revitalization and inclusion of the Indian Knowledge System (IKS) into the modern educational system of India. It is one of the policies that puts a vehement emphasis on the inclusion of traditional Indian knowledge in all levels of education, including school education, up to higher education. NEP 2020 has acknowledged the value of the intellectual tradition of India and the intention to systematically bring disciplines like ancient sciences, philosophy, arts, linguistics and traditional technologies to the contemporary academic curriculum. The policy attempts to fill the divide between classical knowledge traditions and modern scientific inquiry by promoting interdisciplinary learning and contextual education. The Government of India realized the need to provide more institutional support to IKS, and accordingly, increased financial allocation towards Indian Knowledge Systems by a great margin. The budget of 2022-2023 in the Union Budget has raised the amount spent on IKS initiatives to about 20 crores, which indicates that the government takes traditional knowledge system research, education, and distribution seriously. In addition, marketing of IKS has been included under larger national development programs like the Vision 2047 and Bharatiya Rasayanashastra, to investigate the role of Indian chemical sciences in the modern scientific research and innovation. The

initiative is a sign of increasing interest in reviving traditional science and considering how it can be used in the context of the current scientific and technological evolution.

The National Credit Framework (NCF) has made such provisions in order to enable students to gain academic credits by taking courses related to the ancient science of India, arts, and cultural traditions, in order to meet the objectives of NEP 2020. This framework allows flexibility of learning routes and allows students to study the scientific and philosophical input of India's traditional knowledge systems. Consequently, Vedic math, Ayurveda, classical architecture, astronomy, and other traditional knowledge-related courses are slowly being integrated into universities and institutions in the course of higher education.

In addition to this, the University Grants Commission (UGC) has unveiled a number of policy initiatives that have enabled IKS to be incorporated in higher education. The UGC policy suggests that an Indian university should have about 5 percent of the total academic credits of undergraduate and postgraduate level programs on Indian Knowledge Systems. This program is an effort to have the students exposed to the intellectual legacy of India and modern-day scientific fields. Besides curriculum creation, the UGC has also been engaged in massive capacity-building programs to empower the teaching and research environment in the region. Among the key targets is to educate the close to 1.5 million teachers in Indian Knowledge Systems by 2025 [1]. To do this, the UGC has introduced a number of training programs and an online Massive Open Online Course (MOOC) specifically on Indian Knowledge Systems, which allows educators and learners in the country to gain access to organized scholarly materials about the traditions of traditional Indian knowledge. In October 2020, a new government department within the Ministry of Education, Government of India, was created as the Indian Knowledge Systems (IKS) Division, also referred to as the Bharti Airtiya Jnanapara Vibhag. The division has its headquarters at the headquarters of the All-India Council of Technical Education (AICTE), New Delhi and also operates as a national body of managing research, teaching and spreading traditional Indian knowledge [1]. The IKS division focuses on recording, storing and publicizing the various intellectual traditions in India and on interdisciplinary studies that can interrelate ancient knowledge and current scientific as well as societal issues.

6. Conclusion

The IKS division has been able to fund projects on traditional agriculture, architecture, environmental sustainability, health sciences, metallurgy and other practices of indigenous knowledge through various academic and research projects. These programs are aimed at analysing the scientific foundations of the ancient traditions and discussing how they could be applied to contemporary issues like global warming, environmentally friendly use of resources, and the integrated healthcare systems. In a wider sense, the efforts of the IKS division are indicative of an academic and policy interest in the decolonisation of the Indian education system by identifying and incorporating indigenous knowledge traditions historically relegated in the colonial and post-colonial academic paradigm. By understanding both the traditional wisdom and the scientific knowledge of Ancient India, we can gain valuable insights into how our civilisation can progress toward a more balanced and holistic education system. Such a system would integrate the advancements of modern global science while also recognizing and preserving India's rich intellectual and cultural traditions.

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