

Mathematics Education: From Tradition to Transformation in India

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Abstract

Mathematics Education in India is a long journey of transition from oral tradition of an ancient india, focused on spiritual geometry and computation to a technology-driven, conceptual and modern approach aimed at encouraging 21st-century skills. These changes, blends India's rich mathematical heritage with contemporary pedagogy to enhance critical thinking and are mainly formalized by the National Education Policy (NEP) 2020.

Keywords: Education system, Ancient Indian Period, Modern and Medieval period, UGC, NEP.

Introduction

In India, education system has a renowned historical background starting long back to ancient periods. The conventional education system of India, aims not merely on theoretical subjects but also on physical, spiritual, and moral development in a overall education. However, the attack by the foreign invaders and the following social-political changes steer to worsen the condition of these institutions. From the beginning of 18th century, after the British colonial administration in India, applied over a significant change in the Indian system of education. The Britishers started a professional system of education, basically to generate third class employees and administrative servants to fulfill their administrative requirements.

When India got freedom in 1947, after that, serious steps were taken to revise the education system to fulfill the needs of a recently free country. The government given the priority to establish a holistic academic framework, involving schools, colleges, institutions and universities, to

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increase literate people and spread knowledge circulation all over India. A large number of academic committies were made to reconstruct rules-regulations and incorporate changes to handle matters of availability, quality and equity in academics.

From Transition to Transformation

In India, the educational transformation is an insightful narrative, that reflects a transformation from early era, individualized system based in mentorship and philosophy to a general form which is standardized and now undergoing rapidly to digitization.

Native model of teaching in India is mainly represented by the Gurukul system, and is characterized by its holistic development philosophy and relational depth.

Mathematics Education in Ancient Times

Peeping back to ancient times, we find that in this type of structure, a residential setup was mandatory where the shishyas (students) and their teacher (Guru), lived together, in the Preacher's home. This individual closeness and devoted daily routine created a personalized, closed relationship called as the Guru-Shishya relationship, that was a prime factor to the whole academic life of the student. The syllabus used to be detailed, and containing moral and spiritual development but also academic knowledge.

Oral transmission of knowledge was heavily in practice. Also, memorization, and practical application were popular methods of learning. Learning covered subjects of diversive nature, as the Ved-Puranas, astronomy, mathematics, arts, sangeet, and physical fitness etc. Gradually, the system enforced inner soul improvement, personality make over alongside educational teachings. Preachers role was basically as guides and mentors, giving importance training programs on nurchering empathy, conversation skills, and moral intelligence in shishyas.

Aim of Education in Ancient Times

The main aim from this type Education System was to develop a society of well educated and well-rounded personals, inseminating essential values like respect, discipline, humility and obedience through hands-on experiences and direct observation. In this system, the teachers were not only an director, but as an high grade individualized, irreplaceable mentor.

The academic tradition in the India started with the preeaching of conventional and traditional fields such as mathematics, Hindu religions, and in ancient early Buddhist and Hindu centers of teaching- learning, involving the Takshashila (situated in current Pakistan) and Nalanda (within our country). During the medieval times, with the rise of Muslim emperires, the effect of Islamic education became an integral part. There after, the emergence of European powers started English-style education system to India.

Education System during British Rule

After the onset of British rule in India, especially the changes started by Thomas B. Macaulay, a non Indian and destructive model of Education System was introduced that permanently changed the foundation of Indian pedagogy. Macaulay's Minutes delivered in 1835, on Indian Education and the resulting English Education Act of 1835, proved as a harmful milestone for British Indian academic policy. This policy basically gave priority to western knowledge and implemented the medium of teaching as English.

The period of English colonial administration in the 19th century perceived the foundation of a large number of Western-style universities in India. A series of new policies, carried forward upto the middle of the 20th century made the foundation for the academic systems of the Indian Republic, Pakistan and different areas inside the Indian surroundings. Education opens great openings and opportunities for individuals, permitting them power boost via knowledge. It includes the protection and encouragement of learning through different resources.

While going to a formal school and learning from teachers and resource persons, is a very common method, education outstrips these boundaries. At its essential part, education cultivates creativity and exploration. We regularly consume information, throughout our lives, either knowingly (through awaken minds) or unknowingly (naturally in semi-sleep mode).

Aim of New Education Policy in British Period

The inherent aim of the new system was to develop a class of people who are native in skin and blood, but are British in morals, in intellect, in taste and in opinions. This type of interference which was on the fundamentals of Education System resulted to the gradual deterioration of indian centers of teaching and learning. Education Centers of Indian Scientific Traditions—such as Traditional Mathematics, Astronomy and Ayurveda alongwith Indian philosophies and epistemologies were

neglected in favour of a European syllabus which primarily focused on European culture, history and ideas.

This structural reforms in Education System, initiated and implemented by the administration to fulfill the requirement of producing clerks and officials, effectively declined the academic Guru and comprehensive moral to an interchangeable curriculum transmitter which is focused purely on knowledge providing. This shift towards curriculum coverage and preparing well defined evaluation gave colleges' upliftment to the pedantic, professional-era chalk-and-board learning and delivering method. The inclusive stress created by this significant change, which substituted holistic and personalised education by knowledge transmitter, generated the pedagogical stiffness that are being tried to overcome with the use of personalized and modern AI systems.

Education System after Independence

After independence, the main goal of the Indian education system focused towards massive increase in percentage of global general literacy. However, the fundamental construction overall maintained the idealistic, centralized outlines passed down from the British origin rulers. The basic pedagogical focus retained on completion of curriculum and making students ready for high-risks, standardized evaluations.

The implementation of basic change enforced the deliverer's basic functional work as a knowledge provider, and in this way, the specialized role of a teacher is wholly separated from the all inclusive mentor system of the Gurukul. The ongoing cultural pressure on memorization (parroting) and idealistic evaluation nurture deep institutional disagreement.

Modern Policy, NEP 2020

While modern latest policies, e.g. the National Education Policy NEP 2020, mainly focus to promote the coordinator and mentor function, replacing the individualization of the ancient Indian Guru, the persistent system of evaluation behaves as the only strengthful mechanism sustaining the Britishers' foreign teaching system. Teachers cognitively advocate the switch towards furtherance but they are functionally bounded by evaluation systems characterised wholly for knowledge transmitters, producing a difficult contradiction for academic reforms.

The NEP 2020 systematically connects technological involvement with the rules of availability, quality, equity, and policy based system

functioning. The policy makes compulsory use of technicality for digital and online education largely to tackle with purpose of equity. This rule is imposed on different directions—making better delivering-understanding processes, assessing student performances, helping teacher readiness, deleting language obstacles, and improving approach to Disable students (students with physical disabilities) specifically by software upgradation made for special purpose. In addition, the system encourages and amplifies the key technical framework for public, particularly authorizing the upgradation of a huge variety of academic software in every main Indian languages. This digital-content should be created and uploaded onto the platform known as DIKSHA, which the system aims to refine and enlarge.

The NEP 2020 takes into account the advent of troublesome Technicality and Artificial Intelligence, requiring a tedious and committable Indian mindset to execution. The regulations calls for detailed research into new technicalities, involving AI, blockchains, adaptive computer testing, and machine learning. Before any electronic interference is expanded up, the strategy compulsorily demands that its uses and combination be transparently and rigorously examined by sincerely developed steering research in concerned matters.

Latest Artificial Intelligence based Technology

The way towards the present Artificial Intelligence-based society was carved by many years of progressive technical rulings focused at finding the fundamental regulations of quality, approach and equity across the gigantic and varied educational layouts. Starting interventions in policy aimed basically on implementing primary digital infrastructure into most of the schools.

Artificial Intelligence is achieving attraction very fast in national teaching lecturerooms and rulings infrastructures. Observational studies produces a transparent quantity based aspect of the technical pedagogy based and administrative influence over the academic infrastructure. A logical overview after assessing 100 peer-reviewed studies published during 2020 and 2025 endorses the domination of few trends in Artificial Intelligence application in national academics. The research disclosed that the highest important applications are individualized learning systems, Artificial Intelligence-driven evaluations, and Intelligent Tutoring Systems (ITS). However, the similar inspection endorsed several fundamental difficulties,

keeping in mind that study is presently performed in cities, non-government organisations, with minimal participation from village and government colleges, thus minimising the generalization of some studies.

Different Educational Schemes

Former schemes and programmes, e.g. the 1972 Educational Technology scheme and the 1984 scheme (CLASS) Computer Literacy and Studies in Secondary Schools, were gradually combined in 2004 to create the ICT @ Schools scheme. This policy started the methods of introducing ICT (Information and Communication Technology) within the school structure. That scheme was altered two times, first time in 2010 and again in 2011 to increase coverage and make priority for academically not forward areas and blocks with density of previously underprivileged people. Main important infrastructure aims inherent provision of 10 nodes or PCs linked through a transmitter and focusing for atleast 2 MBPS Wi-Fi internet connectivity in each and every school.

Policy factors also involved improving good digital-content, majorly via central organisations like regional institutes and the CIET (Central Institute of Educational Technologies) and providing resource person-based investigations e.g. the National Award scheme ICT for inspiration and academical growth. These policies, enforced after the-2015 Digital India Campaign, established the primary non-private allegiance for dealing computerised framework like a main beneficiary essential for Indian's power boosting and a information economy.

Impact of Educational Policies

Inspite of decades of growing ICT policy, overall acceptance by the society was not very fast till the pandemic of COVID-19. Covid calamity proved an unpredicted and strong booster. Due to the universal shut down of a large no. of educational institutions, it became an unavoidable option for the authorities, to run almost all academic programmes and activities online to ensure the continuity rapidly.

This compulsory digital shifting automatically revealed the highgrade inequalities arising from the infrastructural deficiency because the institutes which have ample resources were able to adapt digital system, while many other institutes had to struggle badly to develop an operational digital teaching-learning system.

This duration of speedy technological reforms transformed into the academic activity named as Education 4.0, that requires transformation of academics involving 4IR (Fourth Industrial Revolution) technologies, including AI. The emergency situations justified the necessity for integrated, radical technical and digital solutions far away only easy technical knowledge.

New strategy related impact resulted fast. Indian New Education 4.0 programme was implemented in the year 2020 (May) by the WEF (World Economic Forum), YuWaah, and UNICEF particularly to handle the panic's intensification of learning asymilarities by computerized resources. This working proved to be a milestone, for attracting altogether around 40 stake holders from the Edu-technical sector, academia and government speedy strategic system movement and combining upgraded technology at a flow that may otherwise would have consumed many years within easy political dealings. In spite of continuous efforts for two decades, successive research confirms that the infrastructure decline persisted for resource availability and policies difficulties.

The aims set through the 2010 policy, such as primary connections, are constantly remained difficult as technological demands and necessities incresed , turning from easy data approach to the major working requirments of Artificial Intelligence. Resent studies made in 2025, uptil specifiies inappropriate resources in village and financially backward sectors and a huge shortage of availability to computerized resources for fundamental, appropriate obstacles for achieving proper Artificial Intelligence acceptance.

Conclusions

Intelligent Tutoring Systems (ITS) and individualized studying systems showcase the spearhead of Artificial Intelligence in the country, working necessarily for affecting the one-to-one, acceptive delivering-learning methods speciality of the Guru Shishya Parampara. Those policies efficientlly balance course material, flow, and learner's experience depending on each learner's ability. Specialised professional examples inherit Artificial Intelligence -enriched apps naming Mindspark and communicaational Artificial Intelligence chatbots which counterfeit one to one teacher interaction.

In addition, specially characterised government initiatives are up coming, to name one, Auticare is a helping technology platform using virtual reality informations based on applied characteristic analysis to cooperate autistic students, in alignment along the system aim to concentrate over students with disability. The effect of Intelligent Tutoring Systems (ITS) is significant—those techniques already resulted affirmative impacts over learner’s inspiration, stability, engagement as well as assessment scores, especially in fields namely science and mathematics. These have been documented for promoting students’ self reliance and improving educational output through providing actual experience as well as acceptive roadways, useful particularly for learners with less resourceful institutions.

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