Role of National Education Policy - 2020 in Development of Educational Institutions of India

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National Education Policy of India 2020

(**NEP 2020**), was rolled out on 29th July 2020, with a vision to transform India's education system by 2040.

NEP-2020 : Vision

- An education system rooted in Indian ethos that contributes directly to transforming India, that is Bharat, sustainably into an equitable and vibrant knowledge society, by providing high-quality education to all, and thereby making India a global knowledge superpower.

- To instill a deep-rooted pride in being Indian, not only in thought, but also in spirit, intellect, and deeds, as well as to develop knowledge, skills, values, and dispositions that support responsible commitment to human rights, sustainable development and living, and global well-being, thereby reflecting a truly global citizen.

NEP-2020

- **Equitable and Inclusive Education: Education for All**

- Global Citizens, Rooted in Indian Culture
- Holistic development of students'
- Creative and critical thinking and teaching life skills.
- Experiential learning, learning by doing
- Skill and Vocational Education
- No hard divisions between streams like Humanities, Science, and Commerce
- Focus on need based research

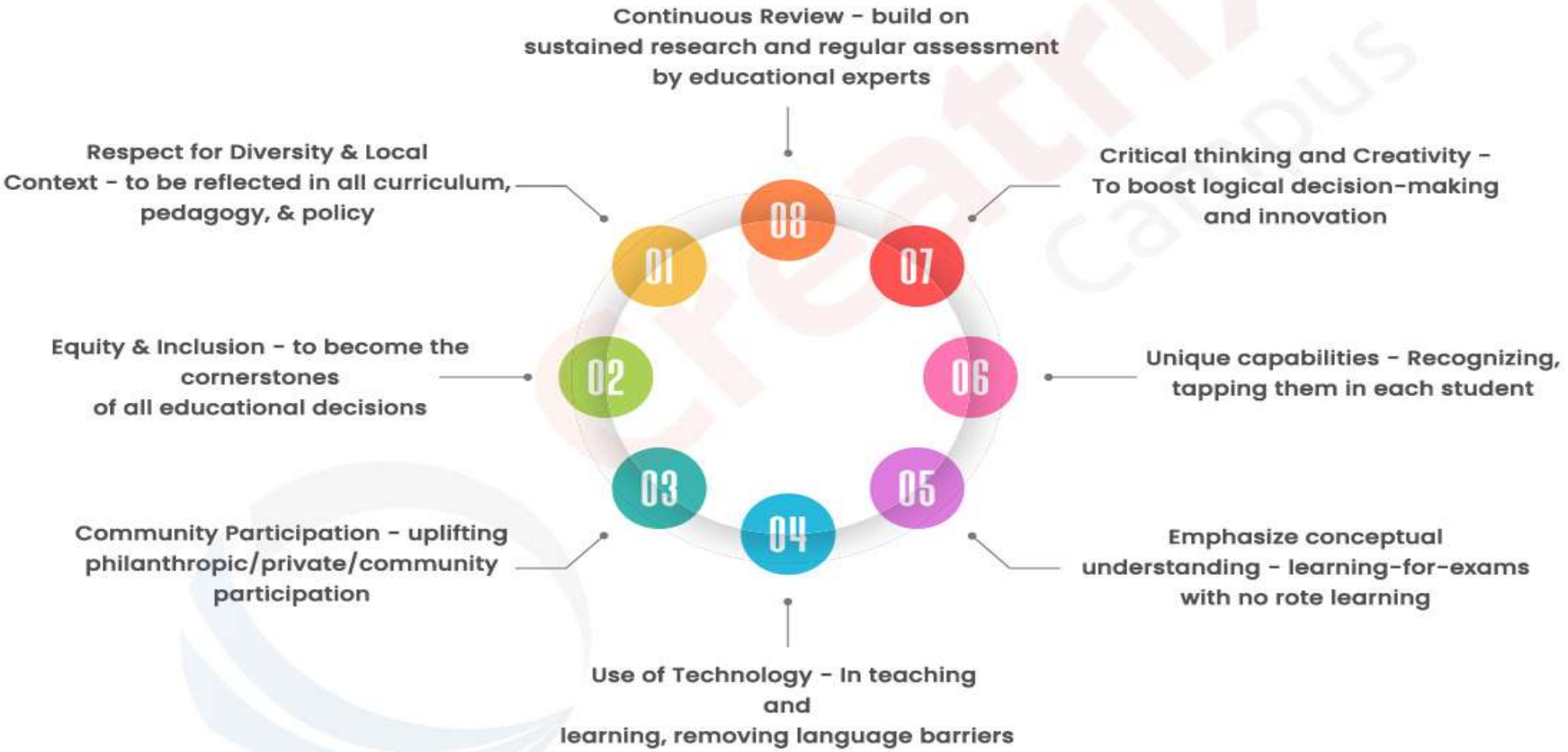
Evolution of Education Policy

- University Education Commission (1948-49)
- Secondary Education Commission (1952-53)
- Education Commission (1964-66) under Dr. D.S. Kothari
- National Policy on Education, 1968
- 42nd Constitutional Amendment,1976-Education in Concurrent List
- National Policy on Education (NPE), 1986
- NPE 1986 Modified in 1992 (Program of Action, 1992)
- T.S.R. Subramaniam Committee Report (27 May, 2016)
- Dr. K. Kasturirangan Committee Report (31 May, 2019)

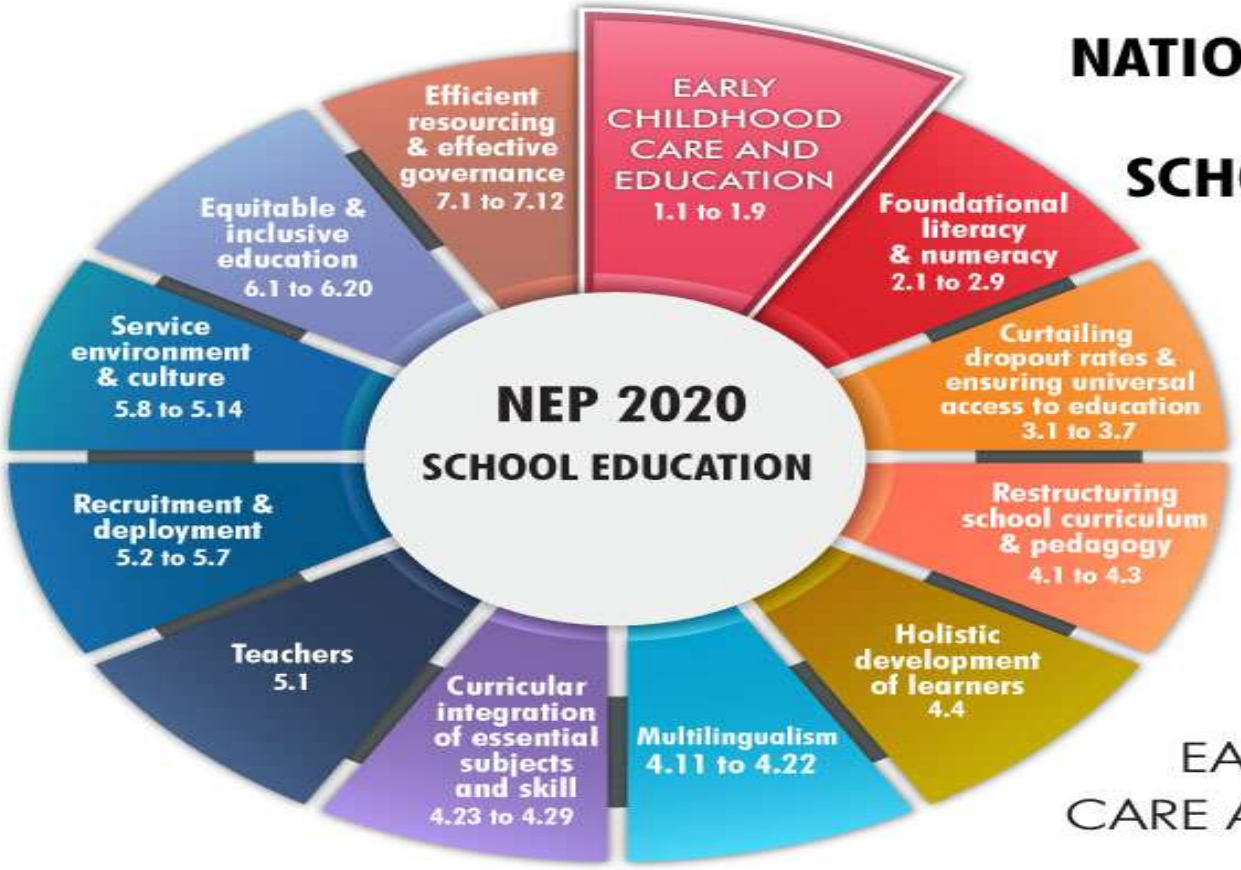
NEP 2020 : Consultation Process

- Online : www.MyGov.in (26.01.2015 – 31.10.2015)
- Nearly 2.5 lakhs Gram Panchayats, 6600 Blocks, 6000 ULBs, 676 Districts (May-Oct. 2015)
- Draft NEP, 2019 Summary in 22 languages/Audio Book
- Education Dialogue with MPs (AP, Kerala, Telangana, TN, Puducherry, Karnataka & Odisha)
- Special Meeting of CABE (21.09.2019)
- Parliamentary Standing Committee on HRD on 07.11.2019

Key Principles of National Education Policy, 2020

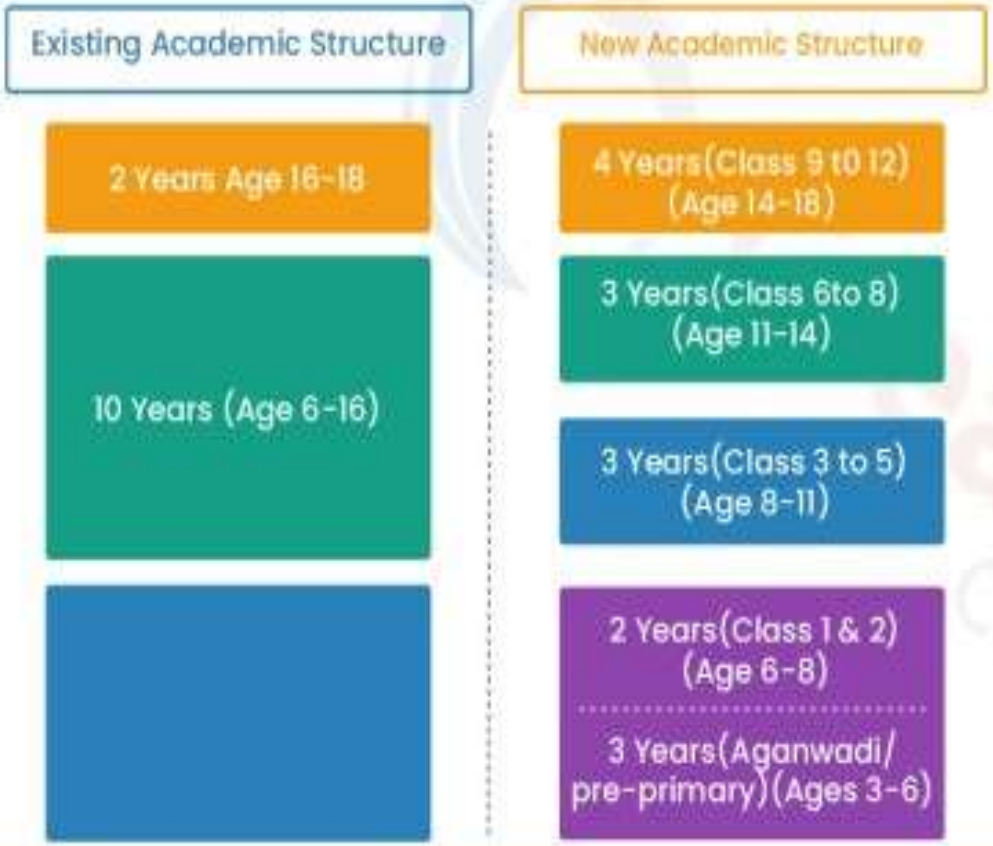


NATIONAL EDUCATION POLICY 2020: SCHOOL EDUCATION



EARLY CHILDHOOD CARE AND EDUCATION

Revised Curricular and Pedagogical Structure



New pedagogical structure (5+3+3+4) --> 3 yrs in Anganwadi /pre-school and 12 yrs in School

- Secondary Stage (4): multidisciplinary study, critical thinking, flexibility in the choice of subjects
- Middle Stage (3): experiential learning in Sciences, Maths, Arts, Social Sciences, Humanities
- Preparatory Stage (3): play, discovery, activity-based, and interactive classroom learning.
- Foundational Stage (5): multi-level, play/activity-based learning

India's NEP 2020: School Education Policies

Ideal Output Samples

Student finishing 8th grade

Better soft skills, tech skills, humane values & competencies

No rote-learning

Better Knowledge of India - its heritage, culture and heroes

No Exam fear!

Respects Unity in Diversity

Vocational Training Received

Knows more than one Indian Language

Good grasp of Mother-Tongue

Highly Adaptive

Knows at least one foreign Language

Fun & activity-based Learning

Simple Curriculum Lesser No. of books

Better all-around Health

Student finishing 12th grade

NATIONAL EDUCATION POLICY 2020

Higher Education curriculum to have Flexibility of Subjects

Multiple Entry/Exit to be allowed with appropriate certification

Academic Bank of credits to be established to facilitate transfer of credits

National Research Foundation to be established to foster a strong research culture

Affiliation System to be phased out in 15 years with graded autonomy to colleges

NEP 2020 advocates increased use of technology with equity; National Educational Technology Forum to be created

NEP 2020 emphasizes setting up of Gender Inclusion Fund and Special Education Zones for disadvantaged regions and groups

National Institute for Pali, Persian and Prakrit , Indian Institute of Translation and Interpretation to be set up

Major Reforms : Higher Education

- 50 % Gross Enrolment Ratio by 2035
- Holistic and Multidisciplinary Education -Flexibility of Subjects
  - Multiple Entry / Exit
  - UG Program - 3 or 4 year (Certificate 1 yr, Diploma – 2yrs, Degree – 3Yrs, Degree with research 4 yrs)
  - PG Program – 1 or 2 year
  - Integrated 5 year Bachelor's / Master's
- Credit Transfer and Academic Bank of Credits
- HEIs : **Research Intensive/Teaching Intensive Universities** and Autonomous Degree Granting Colleges
- Model Multidisciplinary Education and Research University (MERU) (in or near every District)

Major Reforms : Higher Education

- Graded Autonomy : Academic, Administrative & Financial
- Phasing out Affiliation System in 15 years
- National Mission on Mentoring
- Independent Board of Governors (BoG)
- Single Regulator for Higher Education (excluding Legal and Medical)
- On-line Self Disclosure based Transparent System for Approvals in place of 'Inspections'
- Common Norms for Public and Private HEIs
  - Private Philanthropic Partnership
  - Fee fixation within Broad Regulatory Framework
- Public Investment in Education Sector to reach 6% of GDP at the earliest

Major Reforms : Higher Education

- National Research Foundation (NRF)
- Internationalisation of Education
- Integration of Vocational, Teacher and Professional Education
- Setting up of New Quality HEIs has been made Easier
- Stand alone HEIs and Professional Education Institutions will evolve into Multidisciplinary
- Special Education Zone for Disadvantaged Regions
- National Institute for Pali, Persian and Prakrit
- National Educational Technology Forum (NETF)

Indian Knowledge Systems, Languages, Culture and Values

- Focus on Literature & Scientific Vocabulary of Indian Languages
- Language Faculty
- Research on Languages
- Strengthening National Institutes for promotion of Classical Languages & Literature
- Indian Institute of Translation and Interpretation (IITI)
- Cultural Awareness of our Indian Knowledge Systems
- Promoting Traditional Arts / Lok Vidya
- HEI / School or School Complex to have Artist(s)-in-Residence

Use of Technology

- Use of Technology in
  - Education Planning
  - Teaching, Learning & Assessment
  - Administration & Management
  - Regulation - Self Disclosure & Minimum Human Interface
- Increasing Access for Disadvantaged Groups
- Divyang Friendly Education Software
- e-Content in Regional Languages
- Virtual Labs
- National Educational Technology Forum (NETF)
- Digitally Equipping Schools, Teachers and Students

Major Reforms: School Education

- Universalization of Early Childhood Care Education (ECCE)
- National Mission on Foundational Literacy and Numeracy
- 5+3+3+4 Curricular and Pedagogical Structure
- Curriculum to integrate 21st Century Skills, Mathematical Thinking and Scientific temper
- No Rigid Separation between Arts & Sciences, between Curricular and extra-Curricular activities, between Vocational and Academic streams
- Education of Gifted Children
- Gender Inclusion Fund
- Reduction in Curriculum to Core Concepts
- Vocational integration from class 6 onwards

Major Reforms : School Education

- New National Curriculum Framework for ECE, School, Teachers and Adult Education
- Medium of Instruction till at least Grade 5, and preferably till Grade 8 and beyond in Home Language / Mother tongue/ Regional Language
- 360 degree Holistic Progress Card of Child
- Tracking Student Progress for Achieving Learning Outcomes
- NTA to offer Common Entrance Exam for Admission to HEIs
- National Professional Standards for Teachers (NPST)
- Book Promotion Policy and Digital Libraries

Outcomes of NEP 2020

- Attaining Foundational Learning & Numeracy Skills through National Mission by 2025.
- 100% GER in Pre-School to Secondary Level by 2030.
- Bring Back 2 Cr Out of School Children.
- Teachers to be prepared for assessment reforms by 2023.
- Inclusive & Equitable Education System by 2030.
- Board Exams to test core concepts and application of knowledge.
- Every Child will come out of School adopting at least one Skill.
- Common Standards of Learning in Public & Private Schools.

Holistic Education

- Educating the whole person: Addressing the physical, emotional, social, ethical, cultural, academic needs in an integrated learning format. All round developed Compassionate Personality.
- Fosters Mental wellbeing, Critical-thinking Problem Solving Skills.
- Seeks to engage all aspects of the learner, including body, mind, intellect and soul. Its philosophy, is based on the premise that each person finds identity, meaning, and purpose in life through connections to their local community, to the natural world, and to humanitarian values such as compassion and peace.
- Holistic education aims at an intrinsic reverence for life and a passionate love of learning, gives attention to experiential learning, and places significance on relationships and primary human values.

Holistic Education in Ancient India

- India, a country with oldest civilization, rich culture and traditions, built by ***Great Rishis, Saints, Acharyas*** over ages.
- Ancient India - an advanced knowledge-society. ***Vishwa Guru***, due to an education system built on Indian vision aimed at holistic development of individual, development of **body (शरीर), mind (मन), intellect (बुद्धि) and soul (आत्मा)**.
- ***Guru Shishya Parampara :*** The ideal of **Guru Shishya Parmapara** embodies the virtues of **Holistic Education**."Gu" means dark and "Ru" means to remove or eliminate. So, "Guru" leads the "Shishya" from darkness to light. **'तमसो मा ज्योतिर्गमय', 'गुरुः साक्षात परम ब्रह्म'**
- ***Great Institutions of Holistic Learning: Takshashila, Nalanda, Valabhi, Vikramshila, Odantapuri***
  - Banabhatta's Kadambari described a good education as knowledge of the 64 Kalas or arts, which include 'arts', 'science', 'vocational', 'professional', 'soft skills', etc.
  - A blend of **materialism with spirituality**.

Swami Vivekananda

- The ideal of all education, should be **man-making.**
- Education is the manifestation of the perfection already in man.
- We want that education by which **character** is formed, strength of **mind** is increased, the **intellect** is expanded, and by which one can stand on one's own feet.

Bharat Ratna Mahamana Pt. Madan Mohan Malaviya Ji

- **Holistic development** should be the core value of the educational philosophy.
- **Character building** in students is more important than intellectual development.
- **Patriotism** is the best power as the spirit of patriotism motivates to do a high level of selfless service.
- For the development of **physical**, **mental**, and **emotional** powers, a student should follow the principles of ***brahmacharya***, speak **truth**, do **exercise**, have thrust for learning, show **patriotism**, should have **perseverance** in his faith and **love for all** living beings.

सत्येन ब्रह्मचर्येण व्यायामेनाय विद्यया ।
देशभक्त्यात्मत्यागेन सम्मानार्हः सदा भव।।

Value Education for Holistic Development : NEP - 2020

- Indian cultural traditions, **Ethics and Human Values** need to be inculcated in students from the very beginning in order to produce holistically developed students, with developed mind, body and soul.
- Creation of **VISHVAMANAV, Global citizen but rooted in Indian Culture,** is needed with capacity of rational thought, compassion, empathy, courage and resilience, tolerance, creative imagination with sound ethical moorings and possessing Indian traditional values, Patriotism.
- **Values for Self and Planetary importance** : Ahimsa, **'अहिंसासत्यास्तेयब्रह्मचर्यापरिग्रह** : Character building, Care for the Environment, Planetary objects, ***'Vasudhaiva Kutumbakam'.***
- Values of **Social Importance**: Unity in diversity, Yoga, Ayurveda, Vegetarian Diet, Atithi Devo Bhava, Strengthening cultural fabric of the nation.
- **Spiritual Path** : Man and Nature. Indian Cosmology is based in triad of ***Satyam (Truth), Shivam (Godliness), Sundaram (Beauty).***
- Respect for elders, Simplicity, **Love for Country,** virtues for Citizenship.

NEP - 2020

- NEP-2020 envisages Holistic education as way to lead the country into the 21st century.
- It aims at complete realisation of the self and towards national development.
- It suggests major revamping to **implement holistic learning at all levels.**
- **The problems of the society have remained as it is due to the sheer absence of integration of knowledge (holistic approach, complete human being).**
- Holistic education can be realised only when we drift away from compartmentalisation.
- The policy promotes a strong **integration of the learner with nature.**
- NEP-2020 covers the total span of **holistic education** by talking of **education right from the first year to lifelong learning.**
- The school education now talks of 5+3+3+4 years of education integrating the complete curricular and pedagogic framework leading to the overall **holistic development of the child.**

NEP - 2020

- During the first five years, foundation stage, almost 80-85% of the brain development of the child occurs. Education in mother tongue, regional languages will enhance **Holistic Development.**
- **At school level, holistic education would be practiced in letter and spirit. Equal exposure to curricular, co-curricular and extra-curricular subjects and activities.** Physical education, arts, vocational crafts throughout the school level. Social and moral awareness will be enhanced**.** Every child will be treated as unique individual and **organic growth** of the child will be ensured through his natural talent and potential.
- **Learning self-respect and self-esteem, relationships with others**, focus on social "literacy", emotional literacy, *resilience*, *aesthetics* will be key features at school level learning.
- The relation between teacher and the student would be friendly, inspiring, respectful and trusting. **Learning to be made enjoyable with teacher as facilitator.**
- A curriculum for school education would be developed responding to requisite depth, total transparency and would cover a **360-degree horizon for action and activity**, "rooted to culture, committed to progress". No distinction between academic and vocational streams, skills and entrepreneurship to be included at each stage of learning. Learner and the curriculum would always feel connected so that **learning can be enjoyable**

NEP - 2020

- Sessions in classrooms to be more interactive, fun based, enjoyable, creative, with collaborative and exploratory activities.
- **There will be no hard separation of subjects.** Holistic development will be ensured with a wide choice of subjects and courses to be offered each year. Appropriate curricular and pedagogical initiatives are to be taken at each stage to develop various important skills in students, 21st century skills, like artificial intelligence, machine learning, design thinking, holistic health, organic living, etc.
- Curriculum and pedagogy, will be suitably modified to significantly reduce the weight of textbooks in school bags.
- Assessment system in schools will shift from rote memorization tests to more formative, more competency-based, that promotes learning and development of the students, and tests **higher-order skills, such as analysis, critical thinking, and conceptual clarity.** This will ensure better learning outcomes.

NEP - 2020

- Board exams to be made ‘easier’, where primarily core capacities will be tested rather than months of coaching and memorization. Regular assessment/tests/examination will be conducted in schools **to ensure holistic development.**
- The examinations conducted in Grades 3, 5, and 8 and Board Examinations in Grades 10 and 12 would test achievement of learning outcomes, relevant higher-order skills and **application of knowledge in real-life situations,** rather than rote memorization.
- Topic-centered, project-based Clubs and Circles will be organized at school, school complex and districts levels. Science, Math, Music Performance, Chess, Drama, Debate, Sports circles and clubs to be encouraged.
- **Olympiads and competitions** will be organized in various subjects across the country, at school, state and national levels. Olympiads to be organized in rural areas and in regional languages.
- **To promote digital pedagogy**, online apps with quizzes, competitions, assessments, enrichment materials, and online communities for shared interests will be developed. This will promote group activities for students, under supervision of parents and teachers.
- The policy also talks about a new concept of holistic progress card of the

NEP - 2020

- Undergraduate education will have integration of humanities and arts with Science, Technology, Engineering and Mathematics (STEM). This will lead to increased creativity and innovation, critical thinking and higher-order thinking capacities, problem-solving abilities, teamwork, communication skills, in-depth learning and mastery of curricula across fields.
- A student can decide and pursue what he wants to do, whether music, science and any other technological/vocational subject combined with it. **A judicious combination of subjects can be opted.**
- With the holistic education all capacities of human beings - **physical, social, emotional, intellectual, aesthetic and moral** will be developed in an integrated manner. All-rounded individuals conforming to the needs of 21st century will be produced in fields across the arts, humanities, languages, sciences, social sciences, and professional, technical, and vocational.
- Human beings with an ethic of social engagement; soft skills, such as communication, discussion and debate; and persons with rigorous specialization in a chosen field or fields will be produced.

Curriculum

- Curricula shall include credit-based courses and projects, community engagement and service, environmental education, and value-based education.
- **Environment education** will include areas such as climate change, pollution, waste management, sanitation, conservation of biological diversity, management of biological resources and biodiversity, forest and wildlife conservation, and sustainable development and living.
- **Value-based education** will include the development of humanistic, ethical, Constitutional, and universal human values of truth (**satya**), righteous conduct (**dharma**), peace (**shanti**), love (**prem**), nonviolence (**ahimsa**), scientific temper, citizenship values.
- **Life-skills**; lessons in seva/service and participation in community service programmes. will be considered an integral part of a holistic education.
- **Global Citizenship Education (GCED),** a response to contemporary global challenges. To become active promoters of peaceful, tolerant, inclusive, secure, and sustainable societies.
- Students will be provided with opportunities for **internships** with local industry, businesses, artists, crafts persons, etc., as well as research internships with faculty and researchers at their own or other HEIs/research institutions.

With Holistic Education

- Physical development, Morality, character building, patriotism, knowledge and skills in youth will ensure all-round development of the personality **(body, mind, intellect and soul),** preparing a complete human being.

- Highly capable, socially acceptable, skilled, enterprising youth will be produced to provide leadership in various spheres, to face national and global challenges, with dedication to human values, and rooted in glorious Indian culture and traditions.

- A clear commitment to this sentiment is reflected in the National Education Policy - 2020 for the first time in independent India.

- NEP has thus put forth India again on the path to ***Vishwaguru.***

Indian Knowledge Systems, Languages, Culture and Values

- Focus on Literature & Scientific Vocabulary of Indian Languages
- Language Faculty
- Research on Languages
- Strengthening National Institutes for promotion of Classical Languages & Literature
- Indian Institute of Translation and Interpretation (IITI)
- Cultural Awareness of our Indian Knowledge Systems
- Promoting Traditional Arts / Lok Vidya
- HEI / School or School Complex to have Artist(s)-in-Residence

Curriculum : Multidisciplinary Education

- Learning outcome based curriculum framework (LOCF)
- Major Electives
- Minor Electives
- Multidisciplinarity of subjects
- Promotion of online learning : SWAYAM, MOOCs
- Flexibility of curriculum

Mobility of Students

National Credit Framework (NCrF)

- National Education Policy (NEP)-2020 envisages universalization of the credit framework for removing barriers between knowledge, skills and employability, establishing a credit accumulation and transfer system for all kinds of learning for ensuring seamless mobility between learning and skilling pathways.

Mobility of Students

- National Credit Framework (NCrF)
- Mobility across institutions
- Centralized Portal : ID for Students/Institutions
- Academic Bank of Credit (ABC)

  One Credit = 1 hr per week per semester, Theory

  One Credit = 2 hrs per week per semester, Practical/ Tutorial
- Multiple entry and Exit
- Redemption of Credits for Certificate/Diploma/Degree
- Credits can be used for 7 years

Education in Mother Tongue

- Wherever possible, the medium of instruction until at least Grade 5, but preferably till Grade 8 and beyond, is to be the home language/mother tongue/local language/regional language.

- Setting an Indian Institute of Translation and Interpretation (IITI), National Institute (or Institutes) for Pali, Persian and Prakrit.
- S**trengthening of Sanskrit and all language departments in HEIs.**

- Use of mother tongue/local language as a medium of instruction in more HEI programmes.

Increase in Literacy and GER

- To increase the GER to 100% in preschool to secondary level by 2030. Adult literacy.
- Increase in GER in higher Education to 50 percent by 2035.
- Promotion of online learning, ODL, digital intervention, parallel courses.

Institutional Restructuring And Consolidation

- By 2040, all higher education institutions (HEIs) shall aim to become multidisciplinary institutions.
- There shall, by 2030, be at least one large multidisciplinary HEI in or near every district.
- Growth will be in both public and private institutions, with a strong emphasis on developing a large number of outstanding public institutions
- A university will mean a multidisciplinary institution of higher learning that offers undergraduate and graduate programmes, with high quality teaching, research, and community engagement.

Institutional Restructuring And Consolidation

- Autonomous degree-granting College will become multidisciplinary.
- A stage-wise mechanism for granting graded autonomy to colleges, through a transparent system of graded accreditation, will be established. HEIs will have the autonomy and freedom to move gradually from one category to another, based on their plans, actions, and effectiveness.
- HEIs will support other HEIs in their development, community engagement and service, contribution to various fields of practice, faculty development.
- Institutions will have the option to run Open Distance Learning (ODL) and online programmes, provided they are accredited to do so.

Institutional Restructuring And Consolidation

- Single-stream HEIs will be phased out over time, and all will move towards becoming multidisciplinary institutions or parts of vibrant multidisciplinary HEI clusters. HEIs across India will tend to offer instruction in local/Indian languages.
- The system of ‘affiliated colleges’ will be gradually phased out over a period of fifteen years through a system of graded autonomy.
- The present complex nomenclature of HEIs in the country such as ‘deemed to be university’, ‘affiliating university’, ‘affiliating technical university', ‘unitary university’ shall be replaced simply by 'university' on fulfilling the criteria as per norms.

Internationalization of Education

- Curriculum should be compatible to global standards.
- Larger numbers of international students studying in India, and greater mobility to students in India visit, study at, transfer credits to, or carry out research at institutions abroad, and vice versa.
- Research/teaching collaborations and faculty/student exchanges with high-quality foreign institutions will be facilitated.
- High performing Indian universities will be encouraged to set up campuses in other countries.
- Selected universities e.g., those from among the top 100 universities in the world will be facilitated to operate in India.

Higher Education Commission of India (HECI): Four Independent Verticals

- **National Higher Education Council (NHEC):** Single point regulatory (Excluding Medical and Law), "Light but tight".
  - Ensure **integrity, transparency**, and **resource efficiency** of the educational system through audit and public disclosure while encouraging innovation and out-of-the-box ideas through **autonomy, good governance, and empowerment**
- **National Accreditation Council (NAC):** Graded accreditation, IDPs, Highest level of accreditation in next 15 years, Self –governing degree – granting institutions/clusters, Binary process.
- **Higher Education Grants Council (HEGC):** Funding and financing based on transparent criteria, Scholarships and developmental funds for launching new focus area.
- **General Education Council (GEC):** Frame expected learning outcomes (Graduate attributes).

Research

- A systematized effort for creation of knowledge
- For solving problems confronting society, humanity, business, industries, governments, etc.
- It expands the knowledge base and gives latest information
- Knowledge creation and research are essential for growing and sustaining economy
- Strength of a nation depends on research and innovation ecosystem.
- A nation achieves greatness by continuously making new scientific advancements in various fields.
- Best teaching and learning processes occur in environments with strong culture of research and knowledge creation.

Famous discoveries of ancient India

- ***Maharshi Kanaad*** *(600 BC)* : *Vaisheshik Sutra* – Atom, molecules, Concept of gravity and Laws of Gravitation
- ***Acharya Nagarjun*** (200 AD) – Chemist, 'Ras Ratnakar'
- ***Aryabhatta*** : (**476–550** AD) : Aryabhattiyam – Zero, Motion of Planets, Value of pi (π) .
- ***Varahmihir*** (505-587 AD)
- ***Shushrut*** (600 BC) : Father of Surgery, 1120 diseases, 120 instruments, 300 operations
- ***Bhaskaracharya*** (1114-1185) : Principle of Gravity

Some Amazing Scientific Achievements : India

India is among the topmost countries in the world in the field of scientific research

- Aryabhatta 1975, Tejas 2001
- Mangalyan- Only nation to reach Mars orbit in 1st attempt
- Chandrayan 2008 : India's first lunar exploration mission,
- Fiber optics
- Nuclear Capability : Atomic Power as Source of Energy
- BrahMOS – Self sustaining missile; Air Craft Carrier INS Vikrant
- Food grains : rice, wheat, vegetables, milk; Food grains **314.51 million tonnes** in 2021-22
- Atomic clock : To be used in navigation satellites
- Indigenous supercomputer to meet high-speed computational needs.
- Hydrogen fuel cell car
- India's INSAT system is one of the largest domestic communication satellite
- Polio free country, Decrease in death rates, Vaccines against Corona
- The Indian pharmaceutical industry is the third-largest in the world by volume and 14th largest in terms of value. Market size USD 50 bn.
- Fifth largest economy in the world

NEP-2020

Societal challenges of our country can only be addressed by having a strong and vibrant higher education ecosystem with an emphasis on research, innovation, and technology development.

Universities are centres for creation of knowledge

- **Research** : Creation of knowledge

- **Research with Innovation**; Innovation and incubation centres to promote start-up and entrepreneurship, Patents
- **Research with Relevance**: Translational research, commercialisation of technology; serving local, national and global needs, Research in cutting edge areas
- **Quality Publications :** Impact factor, Citations (h-index, i10-index)
- **Research Laboratories:** State of the art, CIF
- **Extramural Funding:** National/International Projects, Industry funded, Larger fund flow from public and private sources.

National Research Foundation

- To promote, expand and catalyze research and innovation with greater credibility and legal authority, a research ecosystem in the country will be created under the stewardship of the **National Research Foundation (NRF).**
- It aims at providing the required impetus to grow the R&D agenda by way of building a research ecosystem comprising the government, universities, research institutes and industry.
- The NRF will work towards seeding, funding, coordinating, and monitoring research and innovation initiatives.
- It will also encourage research through merit-based peer evaluation of research projects along with incentives like awards for outstanding work.
- It will act as a liaison between researcher and relevant branches of govt. and industry.

NEP-2020

Research and Development Cell (An organisational structure)

- For promoting quality research that contributes meaningfully towards the goal of a self-reliant India ("Atma-Nirbhar Bharat"),
- For developing and strengthening the research ecosystem within HEIs.
- To mentor research, To identify Thrust Areas.
- To create a conducive environment for enhanced research productivity.
- To encourage collaboration across industry, government, community-based organizations, and agencies at the local, national, and international levels.
- To facilitate greater access to research through mobilization of resources and funding. To act as a liaison between researchers and relevant research funding agencies.

Selection of Topic/Problem of Research

Identification of relevant research problem:

- Existing status, what it is and what it should be ?
- Prioritizing a research problem
- Based on updated Review of Literature
- Relevance, Avoidance of duplication/repetition,
- Application of results/recommendations, Urgency of data needed
- Significance of the proposed work

Statement of the problem

- To analyze the problem
- To write Research Proposal with clear statement of the problem
- Current and existing problem/target population/planners/ policy makers
- Description of the type of information expected out of Research

Thrust areas of research

- **Energy Sector**

1. Clean energy : Solar, Wind, Water, Electrical, Reduce carbon emission
2. Hydrogen, bio-fuel production, Fuel Cells, Bioethanol
3. Cascading use of biomass : Future of economy, Recycling of Materials, Optimization of waste, Zero waste society, Circular Economy, Lithium ion batteries, Energy storage materials
4. Development of indigenous technologies concerning Utilization of by-products to develop value added chemicals

- **Green and Sustainable Chemistry :** Clean Processes for synthesis of chemicals, Environmental friendly, Biodegradable, Sustainable plastics, Energy efficient infrastructure

Thrust areas of research

➢ Agriculture

- Enhancement in agricultural productivity: Breeding, Biotechnology, GM Crops for Cotton (Bt, 2002), rice, maize, brinjal, tomato, brassicas, mung bean, and potato, Tolerant to stresses, Organic farming
- Biofertilizers, Green ammonia, biopesticides, mycorrhizal fertilizers for sustainable agriculture
- Nutritional security
- Tissue culture pilot plants, Micro-propagation Technology Parks
- White Revolution, application of embryo transfer technology.

➢ **Medicine**: Diagnostics, Bioactive molecules (antibiotics), Biopharmaceuticals, New drug delivery systems, Recombinant vaccines

- Bringing the bioproducts to the market place

Ethics and Good Research Practices

Ethics are the moral principles that students or researchers must follow

Honesty : Strive for honesty, Data, Results, Procedures

Objectivity : Avoid bias in experimental design, data analysis. interpretation

Integrity : Keep promises and agreements; act with sincerity; strive for consistency of thought and action.

Carefulness : Avoid careless errors and negligence; carefully and critically examine your work, Keep good records of research activities, such as data collection, research design, and correspondence

Openness : Be open to criticism and new ideas

Respect for Intellectual Property : Give credit where credit is due, No plagiarism

Responsible Publication: Publish quality papers, to advance research and scholarship

Responsible Mentoring : educate, mentor students. Promote their welfare.

Respect for colleagues

Thank You

धन्यवाद