



ISSN Print: 2394-7500
ISSN Online: 2394-5869
Impact Factor (RJIF): 8.4
IJAR 2023; 9(12): 32-36
www.allresearchjournal.com
Received: 12-08-2023
Accepted: 18-09-2023

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Role of science education under Indian national education policy-2020

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Abstract

The first education policy of the twenty-first century is the National Education Policy, or NEP 2020. On July 28, 2020, the Indian Union Cabinet approved the National Education Policy (NEP). The major goal of NEP 2020 is to promote high-quality, relevant education. Any nation's progress is significantly influenced by advances in science and technology. More integration of science education may be achievable if the younger generation shows enthusiasm for creating new scientific technology. N.E.P 2020 strongly suggests that science teachers should encourage pupils to think creatively and critically about their work. It's our challenge to teach science education at the secondary stage by doing practical work. N.E.P- 2020 can show the pathway of innovative teaching of science education. We all know that secondary-level science is basic science. If our students can conceptualize science joyfully at this level then more incorporation in science education at higher education would be possible. There are so many fields of science education in higher education in our country's education system. Physics, Chemistry, Biological Science, Medical Science, Space Science and different branches of engineering are the different areas of science education. Best doctors, best engineers, the best architects and best scientists are very important for our nation. N.E.P-2020 strongly recommends innovation and research attitude for the students because it develops the scientific temper of the students. A teacher should encourage experimentation in the classroom by using creative teaching tools. For disciplines like physics, chemistry, biology, etc., they should use the scientific lab because science principles can be easily learned through actual application. In the recommendation of N.E.P 2020, there are so many prospects and solutions to assimilate the concept of science education. Through NEP 2020 gradual autonomy and accreditations will be granted to all higher education institutions. Foreign Universities will be allowed to set up campuses in India. The foreign universities would bring in program and institution mobility. If the recommendations of the policy implemented properly with the same intention and spirit, it can make India one of the leading countries in science and technology in the world and will ensure more opportunities at Global level. One of the objectives of NEP 2020 is to develop inventiveness and creativity along with competence. NEP 2020 related to science education clearly states the role of science curriculum in developing different skills to face the real world. The study draws on and reviews the policies with specific reference to the National Curriculum Framework 2005 (NCF 2005) and National Education Policy (NEP 2020). The New Education Policy 2020 is a significant development in the field of education in India, with a priority on primary through higher education. This paper is an attempt to have an understanding of numerous facets of NEP 2020 for the change of the Indian educational sector with special reference to science and technology-related education.

Keywords: Science education, Indian national education policy-2020, scientific technology

Introduction

The world is expanding more quickly because science and technology are developing at a quicker rate. It has also resulted in a paradigm change in social processes. The way that people live has altered as a result of it. Living here has become increasingly difficult. The present generation faces a variety of new and distinct challenges as a result of the advancements in science and technology. We are currently facing a number of interconnected issues in this century, such as an explosion in population, pollution, global warming, forest fires, climate change, and other environmental uncertainties; globalization; the collapse of the economy; terrorism; technological advancements; the possibility of extending life beyond Earth; and other zoonotic diseases. It is difficult and intimidating to train pupils to live in harmony and face the outside world. Students must acquire a variety of skills and knowledge as well as adopt an interdisciplinary perspective in order to stay up with

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a world that is constantly changing. "Lifelong learning is necessary to cope with change and uncertainty," propose by Edwards and Usher. Additionally, pupils must adjust to the changing environment and difficult circumstances. The complex linkages that exist between science education and socioeconomic and cultural diversity can undoubtedly be a useful starting point for creating fresh, innovative, and flexible science education methods. However, in order to develop long-term, practical solutions to address the issue of teaching India's diverse people, the efforts must be carefully considered and reviewed. The modern era is characterised by advances in science and technology. The world's leading nations are those with advanced science and technology. The role of science and technology is taken into consideration when writing NEP 2020. NEP 2020 provides a road map for increasing research to expand our understanding in every field of science and technology. These days, technology plays a vital role in their life. They will deal with environmental issues that arise from the dark side of science and technology, such as cyber fraud. The main effects of NEP 2020 will be to provide Indians with the means to confront issues both current and future, as well as to convert India into a peaceful, scientifically and culturally advanced nation. Everyone agrees that modern teaching methods need to adapt to the needs of today's pupils, broaden their horizons, and tackle multidisciplinary issues of the twenty-first century ^[1]. The National Research Foundation was founded with the goal of accelerating the advancement of science and technology through research funding. Every day, new discoveries and inventions are made in the world of science. The evaluated research proposals in all and various fields are funded by NRF. NRF will establish a research-friendly atmosphere to encourage an increasing number of students to pursue careers in innovation and research. Indian science and technology will advance more quickly thanks to research and innovation. India's scientific and technological advancements will make it a strong, independent nation that can assist the globe in humanitarian endeavours. There should be no delay in preparing pupils to acquire the 21st century learning abilities, and no student should face obstacles or limitations in their pursuit of these skills. The reasons for a new learning paradigm, the particular competences and skills required to operate successfully in the twenty-first century, and the pedagogy necessary to foster such capacities are the three key subjects of the substantial body of literature currently in circulation. In order to prevent pupils from cramming, NEP states that exploratory learning will be promoted. Learning by doing is a more solid and effective method. During this process, the learner watches, considers, analyses, and draws a judgement. They will approach their task in a positive manner. These abilities will be put to use as they create new innovations and technologies. India will have a generation that is aware and enriched in science and technology in the future, which will make India a happy nation. The present study focuses on the recommendations of the National Education Policy (NEP 2020) to explore the role of Science and Technology in the development of individuals, society and country. Acquisition of Skills and scientific temperament in the learners will help to explore global opportunities for their future endeavour. If it is implemented properly, it will prove a pivot in the development of India ^[2, 4].

Science Education

The NCF 2005 offers a number of recommendations about topics and the ideals that should be promoted. The goal of science education is addressed in the section from the NCF 2005 that follows. The framework also suggests modifications to science curricula based on the various learning stages of students. NCF 2005 states that one significant way that humans have responded to the wonder and awe of nature since the beginning of time is to closely observe the physical and biological environment, search for any relevant patterns or relationships, create and employ new tools to engage with nature, and construct conceptual models to make sense of the world. The modern sciences are the result of human endeavour. In general, the scientific method entails a number of connected steps, including observation, the search for patterns and regularities, the formulation of hypotheses, the creation of mathematical or qualitative models, the deduction of their implications, the verification or falsification of theories through observations and controlled experiments, and the eventual discovery of the principles, theories, and laws governing the natural world. In a progressive, forward-thinking society, science is a dynamic, ever-expanding body of knowledge that covers ever-new realms of experience. Science may play a truly liberating function, assisting people in breaking free from the vicious cycle of poverty, ignorance, and superstition. A quality science education is authentic to the child, to life, and to science.

Aims of Science Education

Following immediately from the six criteria of validity - cognitive, content, process, historical, environmental, and ethical - are the overarching goals of science education. To summarize, science education should enable the learner to.

- Know the facts and principles of science and its applications, consistent with the stage of cognitive development,
- Acquire the skills and understand the methods and processes that lead to generation and validation of scientific knowledge,
- Develop a historical and developmental perspective of science and to enable her to view science as a social enterprise,
- relate to the environment (natural environment, artifacts and people), local as well as global, and appreciate the issues at the interface of science, technology and society,
- Acquire the requisite theoretical knowledge and practical technological skills to enter the world of work,
- Nurture the natural curiosity, aesthetic sense and creativity in science and technology,
- imbibe the values of honesty, integrity, cooperation, concern for life and preservation of environment,
- Cultivate 'scientific temper'-objectivity, critical thinking and freedom from fear and prejudice.

National Education Policy 2020 on Science Education

NEP 2020 offers numerous significant ideas about the topic and the morality they ought to uphold. It is now widely known that science education should aim to benefit both society and the student. The framework also suggested many changes to the scientific curriculum in light of the students' diverse learning styles as well as the needs of society and the global community. Human work is the

source of modern science. In a progressive, forward-thinking culture, science is a dynamic, ever-expanding body of knowledge that covers ever-new fields of experience. In the fight against ignorance, superstition, and poverty, science can be a really liberating force.

The scientific method comprises several interrelated stages, including observation, pattern recognition, hypothesis development, and qualitative research design. The National Education Policy (2020) paper has been published by the Ministry of Human Resource Development (MHRD). "Curriculum and pedagogy are transformed by 2022 in order to minimise rote learning and instead encourage holistic development and 21st century skills such as critical thinking, creativity, scientific temper, communication, collaboration, multilingualism, problem solving, ethics, social responsibility, and digital literacy ^[5]. This is the recommended goal for curriculum and pedagogy transformation.

In order to accomplish the goals, the committee has made multiple suggestions. The sections that follow are mostly based on the NEP 2020's guidelines for science education. Through doing, students will learn. During this process, the learner watches, considers, analyses, and draws a judgement. These abilities will be put to use as they create new innovations and technologies. India will produce a more informed and scientifically and technologically literate population in the future, which will make India a happier nation. India is poised to become a global leader in science and technology. The two essential components of educational processes are recommendations and implementations. They complement one another perfectly. NEP 2020 states that any policy is considered good if it is carried out in the same spirit ^[6,7].

Science Education at Secondary Stage

The Secondary Stage replaces the 10+2 education system with the 5+3+3+4 system and entails four years of multidisciplinary study. This is consistent with education in the West. The kids used to start school at age six, but that is no longer the case. Nowadays, children will start basic school at age 3. Students' development and grasp of the material will be improved, and this will support them even more when they pursue higher education. The NEP policy's second humorous feature is that education will henceforth be separated into phases. The primary goal of the strategy is to develop children's thinking skills, and classes 6 to 8 would be more heavily involved in experiential learning. Classes 9 through 12 would be disciplined classrooms where students would have more options and choices. Additionally, apprenticeship learning would start early to preserve a student's charm. Investments in research and education will now rise as well ^[8,9].

Reframing the Syllabus: The subject-oriented pedagogical and curricular style, great depth, increased critical thinking, attention to life goals, flexibility, and student choice will all be the foundations of the curricula. While there will be some required common subjects for everyone, there will also be a great deal of freedom in choosing elective courses, such as those in the arts, vocational training, and physical education, based on personal interests and skills. Context and motivation will accompany it beforehand, and analysis, discussion, and application will follow.

Modular Board Examinations: In order to identify the common courses, a modular board examination system that solely tests fundamental ideas, principles, critical thinking, and other higher-order skills in each topic will be redesigned. For the remaining courses, a great deal of flexibility will be provided. Based on their interests, the students would be free to select any mix of subjects. This is a progressive and much-needed idea, as students will only be most productive when given the freedom to select their own courses.

Vocational Learning and Flexibility: The conventional learning methods, which involved a lot of theory, would be replaced with vocational education. Pupils will learn how to do skilled tasks as an electrician, carpenter, and plumber. It is necessary for every student, regardless of background, to learn and succeed in any programme in India, where these vocations are despised. Students will have flexibility in choosing their studies, especially in secondary school. This includes topics like physical education, the arts, and vocational crafts; they can create their own study programmes and pathways.

Self-Evaluation: At the conclusion of each class period, students will assess both themselves and their classmates. This is a useful and healthy tool to help them identify their weaknesses and assets. This is a critical assessment of one's own performance rather than a ranking of oneself at random. Exam patterns used to be largely independent of logic, with the exception of logical topics like science and mathematics. However, as the exam structure will be changing in the near future, the focus will now be more on practical knowledge.

Equal Credits to All Subjects: Sports, yoga, dance, music, art, sculpture, painting, ceramics, woodworking, gardening, and electric work are all regarded school subjects and will not be classified as extracurricular or co-curricular. The State Councils of Educational Research and Training (SCERTs) in each State may amend, supplement, and rewrite the national curriculum in accordance with the requirements of their respective States. NCERT will create textbooks and syllabi in accordance with the National Curriculum Framework to include these disciplines in the national curriculum.

Interdisciplinary Approach: In addition to studying the social sciences and sciences, all students will have the chance to participate fully in the arts and humanities. Higher education will also discourage such a division.

Incorporation of Vocational in to Academic Streams: The primary and secondary education curricula will guarantee that there won't be a rigid division of the academic and vocational streams because every student will have the chance to develop both types of abilities. Given how quickly the economy is changing, basic abilities are now even more crucial than specialised knowledge. Every child will acquire at least one vocational skill throughout middle and high school, according to the NEP. Vocational education is therefore going to be incorporated across the value chain. By 2025, the goal is to expose 50% of students in K - 12 and postsecondary education to vocational skills. Establishing a hybrid employment environment.

Edtech players/ITI/Polytechnics to Collaborate with Schools: There will be a chance for Edtech companies to work with educational institutions to provide skill-building programmes with a certain level of independence. Short-term certificate programmes may be offered, and new, interdisciplinary courses that complement ODL and online delivery methods will be mandated. Working with secondary schools will provide ITIs and Polytechnics with greater mobilisation opportunities, which will aid in addressing issues connected to awareness and perception.

Learning Science in Regional language: Students whose medium of instruction is the local/home language will begin to learn science bilingually in Grade 8 or earlier, so that by the end of Grade 10 they can speak about science both in their home language and English. This will help the students to understand scientific concepts in a better way, and enable future scientists to talk about their work and about science to their families and to local news channels, write about their work for regional newspapers, and to help inspire the next generation.

Learning Science In Regional language: When science is taught in both English and their native tongue by the end of Grade 10, students whose primary language of instruction is their home or local tongue will start learning science bilingually in Grade 8 or earlier. Better comprehension of scientific concepts will benefit the students, and future scientists will be able to discuss science and their work with their families, local news outlets, and newspapers. It will also serve as an inspiration for the next generation of scientists.

Science Education at Higher Level

To Create Interest in Science and Inculcate Scientific Temper: To encourage undergraduate and graduate students majoring in engineering, medicine, and fundamental sciences to pursue careers in research. Nonetheless, the existing formal education system does not endorse the exploratory approach to science (Indian National Science Academy, 2001). There are times when the school system ignores the subject of diversity. Careers in science continue to be enticing to young brains. Language barriers, gender inequality, a widening rural-urban divide, a lack of basic resources, and poor curriculum development are some of the main barriers to promoting diversity in education. NEP aims to understand the intricate connections between scientific education, culture, and socioeconomic status in order to create cutting-edge, inclusive teaching strategies that will captivate every student.

Integration of Vocational Education with Higher Education: While degree programs such as Bachelor of Vocation (B. Voc.) will continue, HEIs can develop and conduct their own vocational courses in partnership with industry and NGOs. HEIs would also be allowed to offer short-term vocational skill certificate courses. With improved linkages between formal education and vocation education the B. Voc. Programme is likely to gain popularity, especially the ones that are employment oriented and co-developed with industry leaders. Increased market orientation of vocational education will solve the problem of unemployment.

Skill Gap Analysis and Mapping of Local Opportunities: Through engagement with industry at several levels, including co-developed courses and the establishment of incubation centres at HEIs, the NEP aims to concentrate on creating industry links and demand-driven vocational courses. In addition, the policy calls for conformity to international norms. Vocational education focus areas are supposed to be selected by a combination of mapping local opportunities and skill gap research. Under the National Higher Education Qualification Framework (NHEQF), vocational education will be introduced as an additional career pathway. There will be opportunities for corporate involvement in research, joint delivery of short-term skill certificates, and joint establishment of online institutions.

Increased Number of Quality Trained Instructors: The National Curriculum Framework for Teacher Education (NCFTE) will be included in teacher education curricula for vocational education. This is expected to increase the quality and number of trained trainers.

Opportunity for Players Operating in Assisted Technology: Assistive devices, technology-based supportive tools and language-appropriate teaching-learning materials will be made available to assist especially abled students to integrate more easily into classrooms. Implementation of this technology will help promote inclusivity and is also expected to provide opportunity to players in the assisted technology space

Digitalization of Education/Use of ICT tools: NEP weaves the digital thread across the very fabric of the education system resulting in digitalization of education. Technology adoption resonates across all facets of education in the new policy be it for online learning, e-program delivery, teacher training or e-assessments.

Internationalization of Education: The NEP seeks to transform learners into 'truly global citizens', new content needs to be developed keeping in mind the larger learning goals around environmental awareness, resource conservation and other global concerns. It will also pave the way for global employment Opportunity.

Indian students' exposure to the world through exchange programmes and the establishment of foreign university branch campuses in India: International universities will have the chance to open campuses in India and work with Indian higher education institutions. Their Universities will receive autonomy equivalent to that of other independent Indian universities, and a legislative framework supporting their admission will be established. It would be a fantastic opportunity to strengthen ties with Indian educational institutions in order to give teachers and students more exposure to the global community and raise standards of instruction^[10].

Conclusion

NEP 2020 makes the strong recommendation that scientific temper should be developed through research promotion in science education. NEP 2020 aims to foster not only competence but also ingenuity and creativity. At its best, science education in India fosters competency rather than originality and creativity. In conclusion, if some of the New

Education Policy 2020's recommendations are carried out with the same dedication, they could serve as a corner stone for the nation's and its citizens' overall development. They would also assist students in learning and developing the skills that will enable them to adjust to a variety of circumstances. Providing multiple exit and entry points, emphasising learning outcomes and pedagogical innovations, developing autonomous science institutions, international collaboration, redesigning board exams to assess conceptual clarity, developing scientific temper, inter-disciplinary approach, making science education value-based, restructuring science curriculum in accordance with global standards, curriculum flexibility, and emphasising creativity and innovations are some of these recommendations. The importance of science curricula in fostering the development of diverse life skills is expressed in NEP 2020, which is concerned with science education. By working together, HEIs and skill providers - ITIs, Polytechnics, and Industries - will be able to design programmes specifically for HEIs and play a part in reshaping the higher education landscape to better suit the demands of the labour market. Through resource optimisation measures, courses developed in partnership with HEIs will aid in the development of meaningful, employment-oriented offers at reasonable costs. Future issues were taken into consideration when developing policies and suggestions, as the world continues to provide numerous obstacles to individuals, societies, countries, and even the world at large. It is necessary to embrace change and adjust to the constantly shifting circumstances. At the grassroots level, this can be accomplished through the advancement of science and technology while retaining industry as a prerequisite. The world presents many problems to individuals. Policies and recommendations have been developed with an eye towards potential future challenges and with the goal of equipping learners to meet those challenges. Changing education for the twenty-first century is an effort to confront the difficulties of the globalised world and make a difference in it. If correctly integrated and applied with the same intention and spirit, the dynamic recommendations given by both policies can work wonders in assisting learners in learning and acquiring these skills, which in turn aids in their ability to adapt to various situations. The expression "survival of the fittest," which has its roots in Darwinian evolutionary theory, is particularly relevant when discussing how to survive in a world that is changing. He made the accurate statement that the species that is most adaptable to change survives rather than the strongest or smartest. Therefore, one must embrace change and adjust to the circumstances. Only education, the most potent weapon available, can instill this value.

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