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New Education Policy-Lab To Land Vision For Science And Technology

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Abstract

The two 'E's, economy and education hold the key to development and growth of any country. Education plays an important role to enhance the state's economy (Idris, et al., 2012). India has the third-largest higher education system in the world and comes after China. The Indian education system consists of three levels beginning from Primary followed by Secondary at school level and then Higher Education which includes three years of graduation, two years of Post-graduation and four years of Doctoral studies. The type of institutions that provide higher education include central universities, state universities, deemed universities, institutes of national importance, private universities, and colleges affiliated to the University. Education is basic to explore and refine the human potential for all round development of an individual and country as well. Time to time education policies are framed to give direction to the education system as per the requirement of present and future. India had three National Education Policies in 1968, 1986 and 2020 respectively. The latest one is the National Education Policy—2020. The world is growing with a faster pace due to rapid development of science and technology. It has brought prototype change in the lifestyle and social processes as a whole. Changing scenario has brought more challenges along with opportunities to live in. To keep pace with this and to face challenges at global level is exigent and formidable for students. Acquisition of different skills and knowledge-- and interdisciplinary approach towards the world are needed to the students to deal with changing situations. The new education policy 2020 proposes to implement numerous strategic changes in the area of education like research, innovation, infrastructure, multidisciplinary approach, etc. to enhance the development of India. National Education Policy (NEP 2020) aims at exploring the role of Science Education in development of 21st Century Learning Skills which have been recommended with the intent to prepare the learners to face the demanding situations which may vary with spatial and temporal scale. Transforming the education system is an attempt to change the world and face the upcoming challenges. 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.

Keywords : NEP 2020, Multidisciplinary approach, Skill Development, lab to land. Science and Technology

Introduction

The world is growing with a faster pace due to rapid development of science and technology. It has brought a paradigm shift to the social processes as well. It has changed the life styles of the people. It has become more challenging to live in. With the advancement of science and technology new generation has some new and different problems and necessities in modern time. Many interconnected situations like population explosion, pollution, global warming, forest fires, climate change and other environmental uncertainties, globalization, downfall of economy, terrorism, technological innovations, extending life outside earth and other zoonotic diseases we are already facing in the present century. To prepare students to live with harmony and face the world is challenging and daunting. Acquisition of different skills and knowledge as well as interdisciplinary approach towards the world are needed to the students to keep in pace with changing world. Edwards and Usher (2000) suggest, "Change and uncertainty require lifelong learning," And the students need to adapt according to the growing world and challenging situations. Complex relationships that exist between science education and cultural and socio-economic diversity can definitely serve as a valuable basis for designing new, simple yet flexible and diverse approaches to science education. The efforts however, need to be well studied and evaluated in a methodical manner in order to draw long term effective solutions to address the concern of educating the diverse population of India. Modern age is the age of science and technology. Those countries which are advance in science and technology, they lead the world. NEP 2020 is written keeping in mind importance of science and technology. A roadmap is given in NEP 2020 to advance our knowledge in each area of science and technology by boosting researches. Technology has gone to be an integral part of their lives. They will face problems which are born in environment due to ugly side of science and technology like cyber frauds. The major impact of NEP 2020 will be making Indians capable to fight with problems of present and future strongly and transforming India in a scientifically, culturally advanced and enriched peaceful country. There is a clear consensus that new approaches to learning must accommodate the characteristics of today's students, become more inclusive and address twenty-first century interdisciplinary themes (Carneiro, 2007). To speed up the development of science and technology by boosting researches the National Research Foundation was established. In the field of Science, new inventions, discoveries occur every day. NRF funds the reviewed research proposals in all and different areas. NRF will create an environment for doing researches so that more and more students should come in the field of researches and innovations. Researches and innovation will speed up the development of Indian science and technology. The development of Indian science and technology will make India a self-reliant and powerful country which will serve the world for humanitarian work. Preparing the students towards acquiring the 21st century learning skills should not be delayed and no student should be restricted and debarred for gaining or acquiring these skills. There is now a significant body of literature focusing mainly on three topics – motivations for a new model of learning, the specific competencies and skills needed to function effectively in the twenty-first century, and the pedagogy required to stimulate those capabilities (Cynthia, 2015). According to NEP experimental learning will be encouraged so that students can understand the topic instead of cramming. Learning by doing is more efficient and stable. In this process learner observes, analyses, thinks and reaches at a conclusion. From these activities, a quality of thinking with deep understanding will develop in themselves. They will work with constructive approach. They will use these skills in developing new technology, new inventions. In future, India will get scientifically and technologically enriched and aware generation which will make India a happy country. The present study focuses on the recommendations of National Education Policy (NEP 2020) to explore the role of Science and Technology in development of individual, 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 development of India.

Vision for Learning in Present Scenario:- Technology has transformed the whole world in a family. Internet, computers have made easy our lives. Today artificial intelligence (AI) has made possible to do even those works which humans cannot do. It is clear that the development and progress of a country depends on progress of their Science and Technology. For this the learners need skills as per the demand of the society and even country. Personalization, collaboration, communication, informal learning, productivity and content creation are central to the competencies and skills learners are expected to develop these skills. These elements are key to the overall vision of twenty-first century learning (McLoughlin and Lee, 2008; Redecker and Punie, 2013).

In addition, personal skills (initiative, resilience, responsibility, risk-taking and creativity), social skills (teamwork, networking, empathy and compassion) and learning skills (managing, organizing, metacognitive skills and 'failing forward' or altering perceptions of and response to failure) are vital to peak performance in the twenty-first century workplace (Learnovation, 2009). While many of these competencies and skills may seem modern they 'are not new, just newly important' (Salas-Pilco, 2013).

The International Commission on Education for the Twenty-first century produced one report "Learning The Treasure Within" in 1996 under the chairmanship of Jacques Delors of France and later known as Delors Report. It was submitted to UNESCO. The report proposed one of the first frameworks to identify competencies and skills needed for the twenty-first century. The four visions of learning outlined in this landmark report – knowledge, understanding, competencies for life and competencies for action – remain appropriate reference points and organizing principles for identifying competencies for twenty-first century learning (Cynthia, 2015). The Delors Report also formulated four principles identified as the Four Pillars of Education: Learning to Know, Learning to Do, Learning to Be and Learning to Live Together. The Delors framework remains relevant today and can be redefined and expanded for the twenty-first century.

Many International organizations and commissions, governments, private institutions have proposed many policies, frameworks and guidelines and outlined skills and strategies to address the twenty first century challenges. Dede (2010) and Salas Pilco (2013) compared several frameworks to identify the evolution of themes over time and the points they have in common. The researcher intended to explore the recommendations of National Curriculum Framework 2005 (NCF 2005) and National Education Policy (NEP 2020) to study the role of Science Education in development of 21st Century Learning Skills.

National Education Policy 2020 on Science Education

Regarding the subject and the morality they should promote, NEP 2020 makes many important recommendations. The goal of science education towards the student and society is now well understood. According to the varied learning levels of the students and need of the society and the world at a large the framework also recommended numerous alterations in the science curriculum. Modern science is a result of human labour. Science is a dynamic, expanding body of knowledge, covering ever-new domains of experience in a progressive forward-looking society. Science can play a truly liberating role in eradication of poverty, ignorance and superstition.

The scientific approach entails numerous interconnected steps: observation, pattern-spotting, hypothesis-making, and qualitative research design. Ministry of Human Resource Development (MHRD) has produced the National Education Policy (2020) document. With the following objective the transformation of curriculum and pedagogy is recommended, "Curriculum and pedagogy are transformed by 2022 in order to minimize 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"(Sahoo,2021).

To achieve the objectives, the committee has given several recommendations. The following sections from the NEP 2020 mainly based on the recommendations on Science education. Students will learn by doing. In this process learner observes, analyses, thinks and reaches at a conclusion. From these activities, a quality of thinking with deep understanding will develop in themselves. They will work with constructive approach. They will use these skills in developing new technology, new inventions. In future, India will get scientifically and technologically enriched and aware generation which will India make a happy country (Almeida, 2020). India will be one of the leading countries in science and technology in the world. Recommendations and implementations are two inseparable aspects of educational processes. They go hand in hand with each other. According to NEP 2020, any policy is regarded as good when it is implemented with the same spirit and intent.

Science Education at Secondary Stage

The Secondary Stage comprise of four years of multidisciplinary study, removal of 10+2 education and turning to the 5+3+3+4 education system. This is in line with Western education. Earlier, the children used to join the school at 6 years of age but not now. The primary education now would begin from 3 years of age. This will enhance students' growth and grip with studies and will further help them in pursuing higher education. The next amusing fact about the NEP policy is that education would now be divided into stages. Class 6 to 8 would be more indulged in experimental learning to increase the reasoning of the child which is the main focus of the policy. Class 9 to 12 would be disciplinary classes where students would be given more choices and more options plus apprenticeship learning would begin right from an early age so that a student's charm would remain. Now, the investment in education and research will also increase.

Reframing the Syllabus:- Syllabi will be built on the subject-oriented pedagogical and curricular style, immense depth, more critical thinking, more attention to life aspirations, and more flexibility and student choice. There will be some essential common subjects for all, while simultaneously there will be immense flexibility in selecting elective courses including in the arts, vocational subjects, and physical education according to individual interests and talents. It will be pre- accompanied by context and motivation, and post-accompanied by analysis, discussion, and application.

Modular Board Examinations:- A system of modular Board Examinations will be restructured to test only core concepts, principles, critical thinking, and other higher-order skills in each subject - will help to pin down the common courses, while immense flexibility will be offered for remaining courses. The students would be allowed to choose their own subject combination based on their interests. This is in fact a much-needed and very progressive thought as a student will be the most productive only if allowed to choose what to study.

Emphasis on Core Content:- The contents in the curriculum will be reduced in each subject, to its core, focusing only on key concepts and essential ideas. This will provide more space for discussion and understanding, analysis, and application of the key concepts. Teaching and learning must be conducted in a more interactive manner; questioning will be encouraged, and classroom sessions will regularly contain more fun, creative, collaborative, and exploratory activities for students for deeper and more experiential learning. Reducing curriculum load to its essential core content, providing more space for holistic, experiential, discussion-based, and analysis-based learning will improve teaching-learning outcome.

Vocational Learning and Flexibility:- The vocational learning would take over the traditional learning practices which was a lot of theory. Students will be taught the work of electrician, carpenter and plumber in a skilled manner. In India, where these jobs are looked down upon, every student no matter from which background would be required to learn and excel in any of the programs. Flexibility will be given to student

for the choice of subjects to study, particularly in secondary school - including subjects in physical education, the arts, and vocational craft; they are free to design their own paths of study and plans.

Self-Evaluation:- Students will evaluate themselves and their fellows at every end of the session. This is a good and healthy tool to make them realize their downfalls and strengths. This is not a random ranking of oneself but a critical evaluation of one's own performance. Earlier the exam patterns were hardly dependent on any logic except on logical subjects like mathematics and science. But now, emphasis will be on practical knowledge because the pattern of the exams will change in the coming time.

Equal Credits to All Subjects:- All school subjects will be considered curricular rather than extra-curricular or co-curricular, including sports, yoga, dance, music, drawing, painting, sculpting, pottery making, wood working, gardening, and electric work. NCERT will prepare syllabi and textbooks as per the National Curriculum Framework, to incorporate these subjects into the national curriculum, which the State Councils of Educational Research and Training (SCERTs) in States may edit, supplement, and rewrite as per States' needs.

Interdisciplinary Approach:- All students will have the opportunity to engage deeply in the arts and humanities as well as in the study of the sciences and social sciences. Such a separation will be discouraged in higher education as well.

Incorporation of Vocational in to Academic Streams:- The curricula for elementary and secondary education will ensure that there will be no hard separation of vocational and academic streams as all students will have the opportunity of developing both kinds of capacities. With the rapidly changing economic scenarios, fundamental capacities have become even more important than specific skills. The NEP states that every child will learn at least one vocational skill in middle and secondary school. Thus, vocational education will now be integrated across the value chain. The aim will be to expose 50 per cent of the learners in school and higher education to vocational skills by 2025 and Creation of hybrid vocational ecosystem

Edtech players/ITI/Polytechnics to Collaborate with Schools:- Opportunity for Edtech players to collaborate with schools on imparting skilling courses with a certain degree of autonomy will be given. There will be liberty to run short-term certificate courses and the mandate of multidisciplinary and new-age courses complemented by ODL and online delivery channels. ITIs and Polytechnics will have better mobilisation opportunities while working with secondary schools and this will help address awareness and perception-related issues.

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.

Use of ICT Tools:- NEP 2020 recommends that ICT as a tool should be used with care so that it serves to bridge the social divide and equalize opportunity. Given the growing reach of the technology, it is mandatory that efforts are initiated to utilize ICT at the school level to prepare children to face the challenges of a society that is fast transforming into an information driven society.

To Develop Scientific Attitude:- Evidence-based reasoning and the scientific method will be incorporated throughout the school curriculum - in science as well as in traditionally "non-science" subjects - in order to encourage rational, analytical, logical, and qualitative thinking in all aspects of the curriculum.

Science Education at Higher Level

To Create Interest in Science and Inculcate Scientific Temper:- To encourage under-graduate and graduate students of basic sciences, engineering and medicine to pursue research careers. The current formal system of education, however, does not espouse the exploratory way of learning science (Indian National Science Academy, 2001). The education system does at times ignore the issue of diversity. Science still remains an attractive career choice among the young minds. Lack of basic resources, poor curriculum development, language barriers, gender issues and a wide rural-urban divide acts as major barriers when it comes to supporting diversity in education. In the global context, science education is a concern because of the declining interest and dwindling numbers choosing science as careers. NEP aims to understand the mosaic of cultural, socio-economic relationships with science education and accordingly design new approaches to science education that will appeal to all students and are sensitive to diversity.

Emphasis on Vocational Training for Students:- By 2030, substantially increase the system shall have exposure number of youth and adults who have to vocational education relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship.

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.

A Modular Credit-Linked Skilling Framework:- A credit-based framework in sync with the National Skills Qualifications Framework (NSQF) is envisaged to allow easy mobility between vocational and higher education and create vertical and horizontal mobility for students undergoing vocational training. Also, the policy envisages collaboration between secondary schools, ITIs, polytechnics and local industries to promote creation of skill labs under a hub and-spoke model for sharing of training resources. A modular credit-linked skilling framework will further promote lifelong learning amongst the active workforce as well as provide an impetus to scale the apprenticeship ecosystem by enabling engagement of apprentices as per The Apprentices Act, 1961 and the Apprenticeship (Amendment) Rules, 2019.

Skill Gap Analysis and Mapping of Local Opportunities:- The NEP intends to focus on developing industry linkages and demand-driven vocational courses by engaging industry at various levels, including co-developed courses and development of incubation centres at HEIs. Besides this, the policy also envisages alignment with international standards. The focus areas for vocational education are intended to be chosen based on skill gap analysis and mapping of local opportunities. Vocational education as an alternate career pathway under National Higher Education Qualification Framework (NHEQF) will be established. Opportunity for industry participation in research, co-delivering short-term skill certificates, co-partnering in creation of online universities will be provided.

Multiple Entry-Exit Facilities for Students:- students seeking a career in vocational education and related jobs will get a better preview of the same during their secondary school and will have option to obtain higher education degrees later with the introduction of the credit transfer framework.

Increased Demand for Trained Instructors and Trainers:- the NEP mandates an adequate number of teachers in schools across subjects - particularly in subjects such as vocational education. Schools will also be encouraged to hire local eminent personalities or experts as master instructors in vocational subjects. This is expected to result in increased demand of master trainers.

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.

Emphasis on Technology-Based Learning:- Opportunity for Edtech players to collaborate with HEIs offering vocational programs to offer joint degree/certificate programmes: NEP lays emphasis on technology-based learning, delivery and capacity-building solutions. Hence, EdTech players will have the opportunity to develop content, delivery platforms and learning management systems for HEIs and vocational institutes seeking to invest in digital learning. Additionally, they may also collaborate with HEIs to offer degree programs as well as certificate programs in HEI or vocational education

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 specially 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.

Collaboration of HEIs and Skill Providers (ITIs, Polytechnics and Industries):- While industries will have the opportunity to work with HEIs for creating tailored programs that serve their needs, they will also have a role in shaping the larger skills ecosystem to be more aligned with their needs. As the system evolves to become credit based, continuous learning focussed and open to online delivery channels, HEIs and skill providers would have the opportunity work together for developing meaningful, employment-oriented offerings at affordable prices through resource optimisation strategies.

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.

Global Exposure for Indian Students through Exchange Programmes and Setting up of Foreign University Branch Campuses in India:- Foreign Universities will be given opportunity to establish campus in India and collaborate with Indian HEIs. A legislative framework facilitating such entry will be put in place and such Universities will be given autonomy on par with other autonomous institutions of India. It will be a golden chance to increase collaboration with Indian Educational Institutions to widen the international exposure for both teachers/students and improve the quality of education and learning.

CONCLUSION

NEP 2020 strongly recommends that research in science education should be promoted to develop the scientific temper. One of the objectives of NEP 2020 is to develop inventiveness and creativity along with competence. Science education in India at its best develops competence, but does not encourage inventiveness and creativity. At the conclusion some of the recommendations of New Education Policy 2020 if implemented with same soul and intensity it can be a foundation stone for the overall development of country and its citizens and help learners to learn and acquire the skills which in turns will help them adapt to different situations. These recommendations are provision of multiple exit and entry points; focus on learning outcomes ,pedagogical innovations; creation of quality digital resource bank in science education in open access mode to address the issue of equity; creating autonomous science institutions, international collaboration, redesigning board exams to assess conceptual clarity, focus on developing scientific temper, inter-disciplinary approach, making science education value-based, science curriculum restructuring as per global standards, curriculum flexibility & focus on creativity & innovations. NEP 2020 related to science education clearly states the role of science curriculum in developing different skills to face the real world. Collaboration of HEIs and Skill providers (ITIs, Polytechnics and Industries) will create the opportunity to develop tailored programs with HEIs and will have a role in shaping the higher education ecosystem and aligning it with market needs. Courses in collaboration with HEIs will help in developing meaningful, employment-oriented offerings at affordable prices through resource optimisation strategies. The world is posing several challenges for individuals, society and country and even at global level so the policies or recommendations were done keeping in mind the future challenges. One needs to accept the change and adapt according to the ever changing situations. This can be achieved at the ground level by the development of science and Technology keeping in mind the prerequisite of industry.

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