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The Synergy between National Education Policy 2020 in India and STEAM Education



L Manizia, Tulika Borah*, Jyotika Boruah and Gita Doley

Department of Human and Family Studies, Assam Agricultural University Jorhat-13

ABSTRACT

In order to adapt India's educational system to the needs of the 21st century, the National Education Policy 2020, which is considered more inclusive and progressive has been implemented. Simultaneously, STEAM education - an inter/trans/multi-disciplinary approach that integrates Science, Technology, Engineering, Arts, and Mathematics has become a global paradigm in education, encouraging students' critical thinking, creativity, and innovation. This paper delves into the dynamic synergy between National Education Policy 2020 (NEP 2020) and STEAM education, emphasizing the potential of developing a workforce that is knowledgeable and flexible by equipping students with essential 21st-century skills. Lack of research studies on the integration of STEAM education in the context of Indian education system, hindered a proper literature review.

Keywords: NEP 2020, NEP framework, Education, STEAM education, 21st century skills, holistic development, NEP vs STEAM education, art integration, creativity

Introduction

To address the challenges of the twenty-first century, the Indian government reformed the National Education Policy viz National Education Policy 2020 (NEP 2020); an effective paradigm that stresses integrating disciplines to develop creative, flexible, and problem-solving-oriented individuals. The goal of NEP 2020 is to develop an inclusive and progressive educational system that encourages the development of 21st-century skills through teaching, learning, and assessment. The 21st-century skills include the fundamental abilities of digital learning, critical thinking, and real-world problem-solving. Students must acquire the skills necessary for the rapidly changing global environment [4] in order to improve their education, thrive in a globally competitive setting, and equip classrooms and educational institutions with the 21st-century competencies and skills. NEP 2020, focuses on STEAM (Science, Technology, Engineering, Arts, and Mathematics) education in order to equip individuals with the knowledge and skills necessary for the present-day technology-driven world. Further, STEAM education that is the integration of Arts in STEM incorporates 4 C's of 21st century skills - creativity, critical thinking, collaboration, and communication [20]. STEAM education provides free environment that encourages students to feel liberated and take chance, this friendly and unrestricted atmosphere encourages students to exchange original ideas and fosters their creativity. Group discussions, another aspect of STEAM education is to help students develop their ability to communicate and work together. Collaboration and interaction are essential in the twenty-first century, an inclusive, comprehensive and participatory approach is encouraged by

NEP 2020. The main purpose of this study is to find similarities and understand how NEP 2020 fits into the STEAM educational framework-which is considered as one of the most holistic approaches to education.

Key features of National Education Policy 2020

Education policy places a strong focus on helping each person reach their full creative potential. Its foundation is the idea that education should foster not just cognitive abilities such as the "foundational capacities" of reading and numeracy and "higher-order" cognitive abilities like problem-solving and critical thinking but also emotional, social, and ethical qualities and dispositions. The key principles of NEP 2020 seek to guarantee that students obtain multidisciplinary and holistic education across the sciences, social sciences, arts, humanities, and sports, and focus on each individual's unique talents and interests [9].

National Education Policy 2020 has 5+3+3+4 framework, a strong base of Early Childhood Care and Education aiming to enhance overall learning, development, and well-being. The Foundational Stage consist of two parts i.e., 3 years of Anganwadi + 2 years in primary school in Grades 1-2 both covering ages 3-8 and focus on multi-level, play/activity-based learning. Preparatory Stage consists of three years: Grades 3-5 covering ages 8-11 focus on play, discovery, activity-based, and interactive classroom learning. The Middle Stage consists of three years: Grades 6-8 covering ages 11-14 focus on experiential learning in Sciences, Mathematics, Arts, Social Sciences, and Humanities. While the Secondary Stage consist of 4 years: Grades 9-12 covering ages 14-18, focus on multidisciplinary study, critical thinking, and flexibility in the choice of subjects. The main goal of this education reform at all levels is to shift the focus of education from rote learning culture that is still prevalent today to real understanding and learning how to learn. The purpose of education is to develop students' cognitive abilities as well as their character and produce holistic, well-rounded individuals with essential 21st century skills [8].

*Corresponding Author: **Tulika Borah**

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Understanding STEAM Education

STEAM, an acronym for science, technology, engineering, arts, and math originated from STEM which stands for science, technology, engineering, and math. The letter "A" in STEAM which stands for art, is crucial in identifying and developing creative approaches to problem-solving, incorporating ideas, and conveying knowledge. Arts are considered to be the missing link in the chain that connects scientific knowledge with creativity [16]. Art means Physical Art, Fine Art, Musical Art, Language Art; Mathematics-Algebra, Algebra II, Geometry, Statistics, Trigonometry, and/or Calculus. According to Georgette Yakman, a person cannot comprehend science without technology, since engineering is the foundation to most scientific research and development and cannot be developed without a grasp of mathematics and the arts. Georgette Yakman is the pioneering researcher and creator of STEAM education; she started this educational framework in 2006. The approach taken to scientific concepts is the primary distinction between STEM and STEAM. While STEM focuses on hard scientific skills, STEAM uses both soft and hard skills to solve problems. One of the most impressive educational movements in recent years is STEAM education [12][17][18]. Children who receive STEAM-based education are expected to be innovative, creative and critical thinkers, cooperative learners, and effective communicators who can adapt to changing circumstances [15], as STEAM approach emphasizes more of the implicit values in addition to critical and creative thinking, decision-making, problem-solving, and reasoning abilities [19], and through the use of play-based teaching and learning process in STEAM approach these skills are instilled into children. Young children can benefit from the STEAM educational approach by having more natural excitement and curiosity, which lays the groundwork for critical thinking, and decision-making and prepares them for higher academic achievement [1]. Play, which is a form of art in the context of STEAM approach, is inherent in young children and plays a critical role in raising their cognitive level, encouraging greater motivation and engagement, and having a positive impact on the STEM teaching and learning process [6]. Due to the obvious nature of learning in the process of their development, play offers young children more opportunities to explore and learn.

Methods

In order to envisage the synergy between National Education Policy and STEAM Education, several related articles were systematically searched on different databases: Google Scholar, ResearchGate, Shikshan.org, and the Ministry of Human Development (Government of India). These articles were obtained from the databases utilizing keywords search for "NEP 2020", "Education", "STEAM education" and "21st century skills".

Results

From a brief introduction of the National Education Policy 2020 and STEAM Education above, we can already see several similarities between both. The National Education Policy 2020 places a strong emphasis on several objectives and guiding principles that are key components of STEAM education.

How does National Educational Policy 2020 envisage STEAM education?

We examine NEP 2020 and STEAM Education guiding principles and goals in order to find relationships that have the power to reshape the educational narrative and produce new generation

of students prepared for the challenges of the 21st century. STEAM education, holistic and interdisciplinary learning, represents a shift in the global paradigm of education and India's New Education Policy 2020 which is holistic, flexible, and multidisciplinary is a game changer. Emphasizing the alignment between National Education Policy 2020 and STEAM Education:

A. Education that is Holistic and Multidisciplinary: One of the fundamental principles of NEP 2020 is multidisciplinary and holistic education in order to ensure the unity and integrity of all knowledge so as to develop good, thoughtful, well-rounded, and creative individuals [9]. Similarly, STEAM education is a multidisciplinary field that incorporates disciplines with practical learning applications into an integrated pattern [14]. It goes beyond the classroom to offer opportunities that help shape our attitude and behavior, creating well-rounded individuals [20].

B. Emphasis on creativity and critical thinking: According to NEP 2020, each subject's curriculum will be pared down to its core essentials to allow more room for critical thinking. This will also allow to emphasis on ideas, key concepts, application, and problem-solving techniques which will encourage logical decision-making and creativity. On the other hand, creativity, critical thinking, collaboration, and communication are the four Cs of 21st century skills that are incorporated into STEAM education. STEAM education gives students the freedom to consider a variety of topics critically, fostering critical thinking in them.

C. Development of 21st century Skills: The term "21st- century skills" typically refers to the fundamental abilities of digital learning, critical thinking, and real-world problem-solving. The goal of NEP 2020 is not only to develop students' cognitive abilities but also their characters and produce holistic, well-rounded individuals equipped with the essential 21st century skills. On the other hand, STEAM education addresses the challenges of the 21st century and aims to enhance 21st century skills. The essential skills of the 21st century include learning and innovation skills, which are further divided into communication and collaboration, critical thinking and problem-solving, creativity and innovation, and learning. Inquiry, interaction, and innovation which are STEAM paradigms support metacognition, active learning, and other 21st century skills [5].

D. Promotion of communication and collaboration: Communication and collaboration are one of essential skills of 21st century. STEAM education allows students to collaborate to come up with creative approaches to real-life problems and then communicate their ideas with others which enhances their communication skills. Group discussion is another component of STEAM education, which helps students learn how to communicate and collaborate [20].

E. Art integration: There is integration of arts in both NEP 2020 and STEAM education. Art integration enables students to do more than just understand the content and how to solve specific problems by heart. It encourages students to look for different perspectives on the issue, interpret them in their own ways, and use this to keep their knowledge and abilities updated. NEP 2020 has adopted art integration in all stages of teaching and learning. According to NEP 2020, art integration is a cross-curricular pedagogical strategy that is based on subject-specific

concept learning on a variety of facets and expressions of art and culture which will result in strengthening the linkages between education and culture. The new education policy also stated that art integration can support students in expressing their thoughts and feelings. Meanwhile, the integration of arts in STEAM education fosters students' cognitive, emotional, and psychomotor development as well as their critical thinking and problem-solving skills. It also fosters creativity and self-expression [5]. Not only that, the art in STEAM education enables teachers to understand how students use new technologies [13].

F. Fun in learning: The integration of arts in both the educational framework has created a more fun environment for learning. NEP 2020 suggested art integration to be utilized in classrooms to foster happy learning environments. Whereas, arts in STEAM are essential in developing the concept STEM subjects easier and more fun. As, art integration means integrating applied arts and critical thinking into real-world settings. Students' understanding of the application of science to their everyday lives is facilitated by educational approaches grounded in real-world contexts, which also enhance their enthusiasm and satisfaction in tackling real-life issues [21], musical intervention can improve a number of concepts in children [3]. Not only that, STEAM education allows teachers to create a welcoming learning environment where all students are encouraged to engage and contribute. Thereby, improving students' engagement and learning more enjoyable.

G. Promotion of hand-on learning or experiential learning: Knowledge is "being actively constructed by the individual and knowing is an adaptive process within an experiential environment" [10]. NEP 2020 stated that curricula will emphasize experiential learning more than academic content and aim to develop students holistically by providing them the essential 21st century skills, cutting back on content to improve critical thinking and essential learning. It also suggested that if online learning isn't combined with experiential, project-based learning, it will primarily focus on screens and ignore the social, affective, and psychomotor aspects of learning. STEAM education is an experimental and experiential learning approach that shapes and builds knowledge and skill sets over time by fostering critical thinking skills that facilitate the application of knowledge through integrated, context-based projects. Bertrand and Namukasa (2020) [2], in their study stated that teachers valued the process and the character-building skills that students developed. They found that STEAM education is in line with the experiential learning theory's guiding principle, as stated by Kolb and Kolb (2005) [11], which states that learning is best understood as a process.

H. Research and inquiry-based learning: NEP 2020 mentioned that the curriculum of each subject will be reduced to its most fundamental core, in order to focus more on holistic and critical thinking, inquiry-based, discovery-based, discussion-based, and analysis-based learning. NEP 2020 also states outstanding research as a corequisite for outstanding education and development. On the other hand, in STEAM education, because of students' engagement with critical thinking and problem-solving, an inquiry culture has developed in which students' questions and their responses serve as an integral part of the learning process [20]. STEAM education also facilitates students' critical thinking, discussion, and research.

I. Technology usage: Our way of life and thought processes have changed dramatically as a result of the rapid development of technology and technological devices across all domains. Over the past few decades, there has been a significant shift in both the curriculum and the approaches to working with school children. According to UNESCO (2018), the 2030 Agenda for Sustainable Development acknowledges that the widespread use of information and communication technologies has the potential to significantly close the digital gap and foster the development of inclusive knowledge societies. Thanks to technology, a modern classroom can now reach throughout the world and overcome any physical barriers. NEP 2020 suggests the extensive use of technology in education, including planning and management of educational programs, providing more accessibility to special needs students, removing the language barrier, and in teaching and learning. The NEP 2020 also suggests the government to develop and support technology tools for better participation and learning outcomes. On the other hand, STEAM education has brought about a shift in educational paradigm, its abbreviation itself suggests the focus on science, technology, engineering, arts, and mathematics in teaching and learning process to develop well-rounded students. A problem-based approach, real-world challenges, various approaches to problem-solving, student choice, technology integration, and teacher facilitation are all features of the STEAM classroom environment. The technology integration of classroom environment comprises instructional strategies that involves students using relevant technology to solve problems, develop products, or share knowledge [20]. Technology in STEAM education is viewed as a tool by teachers to support their instructional activities and as a tool to aid students in their learning. It is also one of the subjects in STEAM education that will help students develop essential 21st century skills.

J. Conceptual Understanding: The new education policy i.e., NEP 2020 prioritizes conceptual understanding over rote learning. Furthermore, it advocates to promote focus on creativity and conceptual learning. The integration of arts in STEAM education enhances the conceptual understanding of students in various fields through creativity.

K. Reforms in Assessment: NEP 2020 recommends changing the way that assessments are conducted to become more competency-based which is similar to STEAM education's focus on evaluating knowledge application and practical skills.

Conclusion

In conclusion, the synergy between National Education Policy (NEP 2020) in India and STEAM education is complementary, as they both place a strong emphasis on holistic, multidisciplinary learning that is in line with the demands of the 21st century. The tenets of STEAM education – a global paradigm that integrates Science, Technology, Engineering, Arts, and Mathematics to foster critical thinking, creativity, innovation, and other 21st century skills among students are complemented by NEP 2020's emphasis on inclusivity, flexibility, multidisciplinary, and the development of critical 21st century skills. Furthermore, the NEP 2020 and STEAM education share objectives of encouraging art integration, creating an enjoyable learning environment, and placing strong emphasis on inquiry-driven, experiential, and research-based learning. Both frameworks acknowledge the role technology plays in education and promote its wide

application to enhance accessibility, remove barriers, and promote an inclusive knowledge system. Additionally, NEP 2020's emphasis on conceptual understanding rather than memorization, and its demand for assessment reforms, are highly compatible with STEAM education's competency-based assessment approach. Both frameworks recognize the importance of evaluating students' knowledge and practical skills to equip them for the challenges of the rapidly evolving global landscape.

Future Scope

The present study points to several directions for future research. The focus is on understanding how the National Educational Policy 2020 aligns with STEAM education. Future research should aim to develop curricula that integrate National Education Policy 2020 guidelines with STEAM principles to enhance the learning experience. Additionally, it should investigate effective strategies for implementing STEAM education across different educational frameworks. This could support global policies promoting STEAM education and encourage industry-academia collaborations to solve real-world problems, further strengthening the educational framework.

Author Contributions

All listed authors have significantly contributed intellectually to the work and have approved it for publication.

Conflict of Interest

The authors declare no conflict of interest.

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ORCID

L Manizia <https://orcid.org/0000-0001-6328-3368>

Tulika Borah <https://orcid.org/0000-0001-6411-3264>

Jyotika Boruah <https://orcid.org/0009-0000-8532-2268>

Gita Doley <https://orcid.org/0000-0001-5065-6583>

References

- Barrett, D. 2017. STEAM Framework Feasibility Study. Research and Evaluation Department Los Angeles Universal Preschool, 1-17.
- Bertrand, M. G., & Namukasa, I. K. 2020. STEAM education: student learning and transferable skills. *Journal of Research in Innovative Teaching & Learning*, 13(1), 43-56. doi:10.1108/jrit-01-2020-0003.
- Boruah, J. and Borah, T. (2021). The Pharma Innovation Journal; SP-10(9): 37-44; DOI: <https://doi.org/10.22271/tpi.2021.v10.i9Sa.7592>
- Darling, H. L. 2010. Teacher education and the American future. *Journal of Teacher Education*, 61(1), 35-47
- Ge, X., Ifenthaler, D. & Spector, J. M. 2015 Emerging Technologies for STEAM Education, Educational Communications and Technology: Issues and Innovations, DOI 10.1007/978-3-319-02573-5_20.
- Henriksen, D. 2014. Full STEAM Ahead: Creativity in Excellent STEM Teaching Practices. *The STEAM Journal*, 1(2), 15. DOI: 10.5642/steam.20140102.15.
- Herro, D., Quigley, C., & Cian, H. 2018. The Challenges of STEAM Instruction: Lessons from the Field. *Action in Teacher Education*, 41(2), 172-190. doi:10.1080/01626620.2018.1551159.
- <https://shikshan.org/nep-2020/curriculum-pedagogy/#:~:text=The%20curricular%20and%20pedagogical%20structure%20and%20the%20curricular%20framework%20for,ages%203%2D8%2C%20Preparatory>
- https://www.education.gov.in/sites/upload_files/mhrd/files/NEP_Final_English_0.pdf
- Karagiorgi, Y., & Symeou, L. 2005. Translating constructivism into instructional design: Potential and limitations. *Journal of Educational Technology & Society*, 8(1), 17-27.
- Kolb, A. & Kolb, D.A. 2005. *Experiential Learning Theory Bibliography, Experience Based Learning Systems*, Cleveland, OH.
- Kuenzi, J. 2008. Science, Technology, Engineering, and Mathematics (STEM) Education: Background, federal policy, and legislative action, Congressional Research Service Reports. Retrieved from: <http://digitalcommons.unl.edu/crsdocs/35/>
- Kuure, L., Halkola, E., Iivari, N., Kinnula, M., & Molin-Juustila, T. 2010. Children imitate!: appreciating recycling in participatory design with children. Paper presented at the 11th Biennial Participatory Design. Sydney, Australia. <https://doi.org/10.1145/1900441.1900460>
- National Governors' Association 2007. *Innovation America: A final report*. National Governors Association, Washington DC.
- Quigley, C. F., & Herro, D. 2016. "Finding the joy in the unknown": Implementation of STEAM teaching practices in middle school science and math classrooms. *Journal of Science Education and Technology*, 1-17.
- Rabalais, M. E. 2014. STEAM: A national study of the integration of the Arts into STEM instruction and its impact on student achievement. (Doctoral Dissertation). Retrieved from ProQuest Dissertations and Theses.
- Reiss, M., Holman, J. 2007. *STEM Working Together for schools and colleges*. London: The Royal Society.
- Sanders, M. 2009. STEAM, STEM education, STEM mania. *The Technology Teacher*, 68(4), 20-26.
- Shahali, E. H., Halim, L., Rasul, M. S., Osman, K., & Zulkifeli, M. A. 2017. STEM Learning through Engineering Design: Impact on Middle Secondary Students' Interest towards STEM. *Eurasia Journal of Mathematics, Science and Technology Education*, 13(5), 1189-1211. <https://doi.org/10.12973/eurasia.2017.00667a>.
- Singh, M. 2021. Acquisition of 21st Century Skills Through STEAM Education. *Academia Letters*, Article 712. <https://doi.org/10.20935/AL712>.
- Thi Phuoc Lai Nguyen, T. 2020. STEAM Education in Secondary Schools: Teachers' Perspective towards Sustainable Development. *Sustainability MDPI*.