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Multidisciplinary Framework For Higher Education @ STEAM

Garima Singh* Dr. Dinesh Kumar**
*Senior Research Fellow, Department of Education, University of Lucknow
**Professor, Head and Dean, Department of Education, University of Lucknow

Abstract

The National Education Policy (NEP) 2020 of India introduces a transformative multidisciplinary framework in higher education, aligning with the global STEAM (Science, Technology, Engineering, Arts, and Mathematics) approach to foster holistic, flexible, and innovative learning. Utilizing a conceptual methodology, the study explores secondary data from internet sources, journals, and policy documents, including NEP-2020, to examine its objectives and implementation strategies. The findings underscore NEP-2020's emphasis on flexible curricula, choice-based learning, and multiple entry-exit options, which align with STEAM's interdisciplinary, project-based, and student-centred approach. Globally, STEAM programs integrate Arts with STEM to enhance critical thinking, and problem-solving, and innovations as seen in initiatives in universities of USA and South Korea's creative convergence education. The implementation of a STEAM-based multidisciplinary framework can enhance employability, innovation, and inclusivity, with strong solutions to societal challenges like climate change and technological advancements. By fostering 21st-century skills and breaking disciplinary silos, this framework prepares graduates for a dynamic, AI-driven workforce. The study concludes that integrating STEAM within NEP-2020's vision can create a learner-centric ecosystem, promoting transdisciplinary collaboration and global competitiveness in Indian higher education.

Keywords: Multidisciplinary framework, STEAM, NEP-2020, higher education, transdisciplinary collaboration.

Introduction

The National Education Policy -2020 approved by the Union Cabinet on July 29,2020 marked a significant milestone in the reforming education system at all the stages of education. Since its approval, the implementation of NEP-2020 has been underway, with both central and state governments working to enact the proposed reforms and initiatives outlined in the policy (NEP,2020). The Policy 2020 envisions a profound transformation in higher education as it adapts to the complexities of the 21st century to address the diverse needs of learners and the rising demands of the global workforce.

The introduction of STEAM (Science, Technology, Engineering, Arts and Mathematics) education under NEP-2020 in higher education can enhance higher-order thinking capacities, problem-solving abilities, teamwork, and communication skills (Kumar, 2020). Earlier it was STEM (Science, Technology, Engineering, and Mathematics) model an interdisciplinary model of education which was valuable for technological and scientific advancements and focussed heavily on technical skills at the expense of creativity and the arts. STEAM, by integrating the arts, challenges this narrow focus and encourages a more holistic understanding of complex issues.

The World Economic Forum calls for skill-based education as crucial for the upcoming Industrial Revolution, making STEAM-based education a strategic priority (Kumar, 2020).As STEAM education continues to thrive love for learning, encouraging cross-disciplinary thinking, empowering the upcoming and present generation to make significant contributions in different fields, such as the Internet of Things (IoT), Artificial Intelligence (AI),Big Data Analytics, Cloud Computing, and Advanced Robotics are now integral parts of the curriculum aiming to enable individuals to continuously update their skills. The Aalto University in Finland and the Massachusetts Institute of Technology (MIT), United States show a shift towards non-binary curriculum models, moving away from the traditional separation between art and science (Colucci-Gray et al., 2019b).

The STEAM curriculum was designed using research on how creativity works and how it can be developed. Creativity is often explained through types of thinking that is convergent thinking, which finds one correct answer, and divergent thinking, which explores many possible answers. Creative programs usually teach students to think in more flexible and original ways using divergent thinking. While many studies focus on younger children, older students are actually better at this kind of thinking, making college a great place to help students become more creative (Madden et al., 2013). This study explores the multidisciplinary framework under NEP-2020, examines the STEAM-based curricular model across different countries, and proposes strategies of integrating STEAM into Indian higher education. By analysing secondary data from journals, internet sources, and policy documents, the research underscores the need for a multidisciplinary approach to address societal challenges such as climate change, pandemics, and technological advancements (Jain, 2021). This paper highlights five key strategies towards integrating STEAM with NEP-2020 in order to create a learner-centric ecosystem, enhancing global competitiveness in Indian higher education.

Related Literature Review

A series of studies underscores the transformative potential of STEAM education in fostering creativity, critical thinking, and interdisciplinary learning. Madden et al. (2013) introduced a STEAM program at SUNY Potsdam, supported by Lockheed Martin, integrating arts, humanities, and STEM to develop adaptable, innovative professionals. The program emphasized teamwork, mentoring, research, and collaboration with external organizations to better prepare students for real-world challenges. Similarly, Lewis (2015) explored STEAM's role in bridging the divide between liberal arts and STEM disciplines, arguing that STEAM uniquely fuses humanistic inquiry with technological knowledge rather than positioning the arts as supplementary. Thurley (2016) highlighted the importance of integrating science into English courses to develop citizen-scientists equipped to tackle global challenges. Through a science-infused English curriculum,

students gain critical thinking and communication skills, fostering deeper scientific understanding and imagination.

Perignat and Katz-Buonincontro (2019) reviewed 44 articles to analyse various definitions, goals, and integration methods in STEAM education. They categorized integration approaches as interdisciplinary, multidisciplinary, cross-disciplinary, transdisciplinary, and arts-integration, while emphasizing the role of creativity and arts-based outcomes. Aguirre et al. (2020) also stressed the benefits of STEAM in higher education, presenting it as a method for holistic learning through transdisciplinary strategies that merge STEM and arts. Their findings highlighted increased student engagement, collaborative learning, and a more inclusive educational model, although challenges such as educator training and assessment still remained.

Yamada (2021) linked STEAM to Japan's Society 5.0 vision, which seeks a human-centred, technologically advanced future. The paper called for reforming Japan's STEM education by integrating the humanities and arts to cultivate next-generation competencies. Examples from the University of Tsukuba illustrated how blending disciplines could help address demographic and economic challenges. In the Indian context, Shukla et al. (2022) assessed the implementation of NEP-2020 through nationwide focus group discussions with school principals. The study revealed that flexible, multidisciplinary options can enhance students' cognitive, emotional, and social development, better aligning education with workforce demands.

Further expanding STEAM's scope, Bedewy and Lavicza (2023) proposed a "STEAM+X" framework that integrates various disciplines, including culture, architecture, and history, into the core STEAM structure. Their research emphasized design-based, transdisciplinary learning that promotes creativity and critical thinking by bridging traditionally separate fields. Gu et al. (2023) evaluated a creativity training program that combined theoretical instruction with STEAM-based activities. Participants demonstrated significant improvements in creativity metrics and self-efficacy, validating the approach in a productive way to nurture innovative capacities in university students. Research suggests that STEAM education has a transformative impact on higher education by dissolving rigid disciplinary boundaries and emphasizing the interdependence of knowledge across the disciplines.

By embedding integrated, project-based experiences into university curricula, STEAM can foster a learning environment which can develop both advanced technical skills and essential human qualities among students. Specifically, the literature highlights that STEAM nurtures curiosity, creativity, critical thinking, cultural sensitivity, communication, and collaboration attributes that closely align with the widely cited "4 Cs of 21st century learning": Critical thinking, Collaboration, Creativity, and Communication, with some scholars also including Confidence (Carter et al., 2021). This approach not only equips students with the competencies to address complex, real-world problems but also cultivates adaptable, reflective, and innovative thinkers who are prepared to prosper in rapidly changing global contexts.

Objectives of Study

The objectives of this study are as follows:

1. To highlight the multidisciplinary framework in Indian Higher Education under National Education Policy - 2020.
2. To understand the concept of STEAM based curricular model in higher education with reference to different countries.
3. To propose strategies for implementation of STEAM based multidisciplinary curricular framework in higher education.

Methodology

The methodology for this research paper is a conceptual study of prospectives of STEAM-based multidisciplinary education and document analysis of National Education Policy-2020, highlighting various aspects, objectives and analysis of STEAM based curricular model in higher education with reference to different countries. The secondary data sources are internet, journals, and websites.

Need of Study

As we progress and proceed more and more, towards potentials in the information and communication technology (ICT) oriented and artificial intelligence-dependent society, the unskilled and semi-skilled level jobs, shall be taken over by machines and computer/mathematics and technical based jobs shall be more in demand. With growing challenges due to pollution, climatic alterations, crises in basic needs and most importantly, constant threat of pandemics, there shall be increased requirement of jobs and research collaborations in sciences, technology, medicine, agriculture, engineering, social sciences and arts. The lack of a multidisciplinary approach to education has been a great barrier to the development of higher education in India.

With the introduction of NEP-2020, there is now an opportunity to address these challenges through STEAM-based multidisciplinary, interdisciplinary, and transdisciplinary educational approaches. This framework can allow students to transcend global boundaries and contribute to transdisciplinary collaboration and innovation in higher education and research (Jain, 2021).

Multidisciplinary Framework Under the Umbrella of National Education Policy 2020

Multidisciplinary framework refers to exposer to many discrete and autonomous disciplines. While students normally specialise in one discipline, now they will have the opportunity to make creative combination of different subjects, in an interdisciplinary manner or with minimum interaction between the disciplines. Example of this can be, an addition to accounting subjects, students studying some subjects in finance can also study disciplines such as history and music. Earlier the Yash Pal Committee Report (2009) also has advocated the need for multidisciplinary education in higher education system as stated in report “there is a need to expose students, especially at the undergraduate level, to various disciplines like humanities, social sciences aesthetics etc.,” the report has called for a transformative shift in traditional educational practices.

This curricular structure can accommodate diverse interests, aspirations, and learning styles, making higher education more attractive and accessible to a larger segment of the population. NEP -2020 integrates vocational education into mainstream higher education, aiming to evolve practical, job-oriented courses alongside traditional academic programs.

NEP, (2020) states that departments in Languages, Literature, Music, Philosophy, Indology, Art, Dance, Theatre, Education, Mathematics, Statistics, Pure and Applied Sciences, Sociology, Economics, Sports, and other such subjects needed a multidisciplinary, stimulating Indian education and environment that can enhance the relevance of higher education to the needs of the workforce, attracting a broader spectrum of students who seek both academic and vocational skills.

Through the implementation of a holistic multidisciplinary approach the policy states to break the disciplinary silos and bridge the separation between Arts and Science, vocational and academic streams. To achieve this, the policy advocated reforms that promote rigorous research-based specialization and opportunities for multidisciplinary work, including academia, government and interdisciplinary study at undergraduate and postgraduate programs (NEP, 2020). The new framework of multidisciplinary courses formulated by the policy consist of following changes:

1.Flexible Curricular Structures

Choice based credit system (CBCS) encourages students to select courses across disciplines such as sciences, social sciences, arts, humanities, and vocational subjects enabling academic breadth and depth. The framework includes for students from non-traditional backgrounds, adult learners, and those with unique life circumstances to pursue higher education on their own terms. Undergraduate programs offer certificate, diploma, and degree pathways through **multiple entry and exit options**, allowing students to tailor their educational journey and re-enter at different stages if needed.

2. Holistic and Integrated Education

The first year of undergraduate education provide a broad-based foundation, exposing students to a wide range of disciplines before specialization. The curriculum is designed to nurture critical thinking, creativity, communication, problem-solving, and ethical reasoning, alongside disciplinary knowledge.

3.Institutional Restructuring

The policy encourages the transformation of all higher education institutions into large multidisciplinary universities or colleges, each hosting thousands of students and offering diverse programs. Standalone and single-discipline institutions are to be phased out or merged into multidisciplinary clusters, promoting cross-disciplinary collaboration and research.

4. Academic Collaboration and Mobility

The **Academic Bank of Credits** (ABC) facilitates credit transfer, allowing students to build personalized STEAM learning paths (Ministry of Education, 2020). Students can accumulate credits from different institutions and disciplines, facilitating mobility and lifelong learning.

Institutions are encouraged to foster interdisciplinary research, joint projects, and collaboration between departments and external partners.

5. Faculty Development and Governance

Educators are empowered with autonomy to design innovative, multidisciplinary courses and assessments. **Continuous professional development** through faculty training is mandated to equip educators for cross-disciplinary teaching and research.

6.Establishment of Multidisciplinary Education and Research Universities (MERUs): These institutions will set benchmarks for multidisciplinary teaching and research excellence. NEP-2020 envisions the establishment of Multidisciplinary Education and Research Universities (MERUs) as part of its broader reform in higher education. These MERUs are designed to serve as model public institutions that will provide quality education, and will increase emphasis on communication, discussion, debate, research, and opportunities for cross-disciplinary and interdisciplinary thinking (University Grants Commission, 2021)

7.Integration of Vocational and Professional Education:

Vocational subjects and professional programs are to be integrated within mainstream academic offerings, blurring the lines between traditional and applied learning.

STEAM

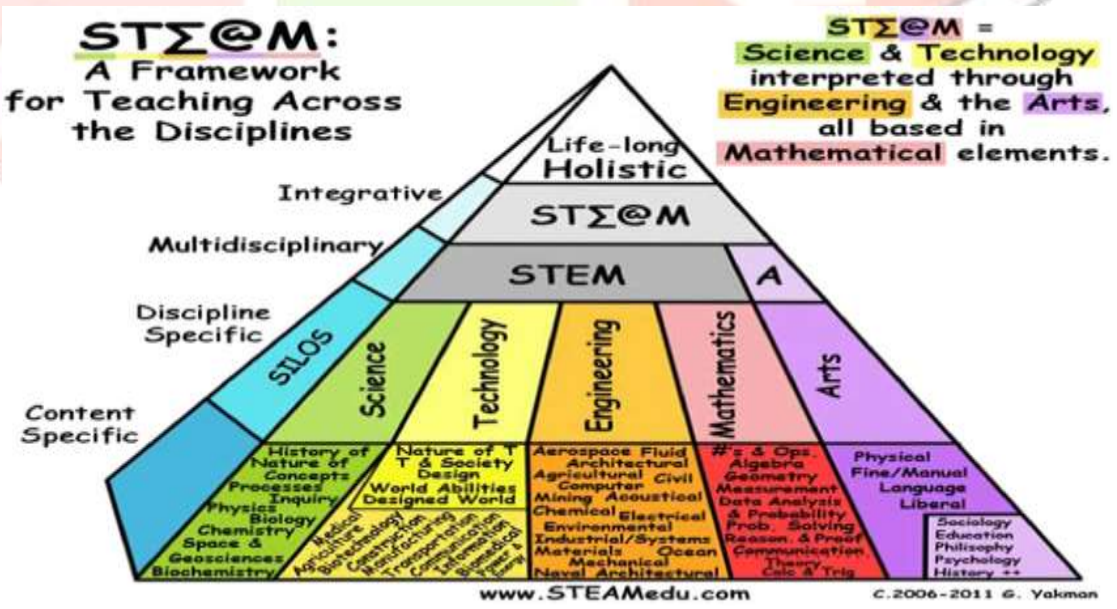

Fig: STEAM Educational framework (Yakman, 2008)

The acronym STEM (Science, Technology, Engineering, and Mathematics) was coined by Dr. Judith Ramaley in 2001, the assistant director of the human resources directorate at the U.S. National Science Foundation. This educational framework merges knowledge from connected disciplines, such as Zoology, Botany, and Genetics, to provide a holistic view of fields like the Life Science. The method is distinguished by its deliberate combination of instructional techniques and educational content across these areas of study. When

these subjects are combined in the curriculum, it is possible that one area might serve as the central focus, or they might all be integrated without any single one taking precedence. The integration of 'Arts 'with STEM forms a multidisciplinary umbrella of STEAM which is an educational approach that combines perspectives from Science, Technology, Engineering, the Arts, and Mathematics with more scientific inquiry, discussion, and critical thinking. STEAM develops technical skills with soft skills, fostering innovations and holistic problem-solving. Technical skills involve specialized knowledge and expertise in areas of scientific technological tools, engineering processes and mathematical computations (Madden et al., 2013; Peppler, 2013). Arts in STEAM develops soft skills such as communication, collaboration, critical thinking and creativity, enabling innovative and human-centred solutions (Henriksen, 2014; Liao, 2016) and prepare students for dynamic careers by combining technical skills with empathetic, creative thinking (Land, 2013). This approach aims to develop students to collaborate effectively, and navigate the creative processes (Henriksen et al., 2019).

STEAM refers to "Science & Technology interpreted through Engineering & the Arts, all based in Mathematical elements" (Yakman, 2008). STEAM inculcates "generating qualities that promote learning, cooperation and multi-modality, flexibility, reflection, experimentation and curiosity" (Carter et al., 2021b). It is a transformative shift in education that is student-centric, holistic and allows students to explore and establish new knowledge being comfortable with uncertain end-result.

The STEAM framework, as stated by Yakman (2010), integrates five basic disciplines: Science, Technology, Engineering, Arts, and Mathematics in which 'Arts' include fine arts, language, liberal arts, motor and physical education, history, philosophy, politics, psychology, sociology, theology, and other humanities and social sciences (Yakman, 2010).

The STEAM in context of Higher Education can be defined as a process-driven, student-centric, and holistic paradigm that promotes experimentation, embraces uncertainty, and allows room for failure (Carter et al., 2021b). The STEAM approach is based on several principles, processes, project-based forms, where students work collaboratively to solve the assigned educational tasks. These educational tasks are experimental in nature, and the final results can be applied to various stakeholders like families, schools, universities, enterprises, and even cities (Shukshina et al., 2021).

The STEAM approach stresses on interdisciplinary nature of learning, where educational processes require the integration of knowledge and skills from multiple scientific and arts-based disciplines.

Analysis of STEAM Based Curricular Model in Different Countries

Over the time, the integration of STEAM in higher education has grown from an educational reform concept to a dynamic framework for interdisciplinary learning. As higher education institutions seek to prepare graduates for rapidly changing global industries, STEAM approaches have become instrumental in promoting creativity, critical thinking, and cross-disciplinary collaboration. This analysis focuses on the implementation of STEAM in higher education across five countries viz USA, Japan, Finland, Australia, South Korea, and Russia with content analysis drawn from research conducted between 2008 and 2024.

USA

U.S. universities have developed STEAM programs, particularly in STEM-related fields, to incorporate arts and humanities. The program collaborates with local schools to implement STEAM pedagogy, focusing on student engagement and content understanding. Some institutions integrate arts into STEM courses to enhance creativity and problem-solving. For example, Drexel University's Expressive & Creative Interaction Technologies (ExCITe) Centre pursues transdisciplinary arts-STEM collaborations, incorporating external arts and education partners to develop innovative curricula (Y. E. Kim et al., 2019). Courses may include projects like origami in engineering to blend artistic design with technical skills (Kennedy et al., 2016).

STEAM in U.S. higher education often employs project-based learning (PBL)to integrate disciplines.

The maker movement has influenced STEAM implementation, with universities establishing makerspaces for hands-on learning. Drexel's ExCITe Centre uses making activities to promote collective creativity, where students use arts, crafts, and technological tools to develop interdisciplinary projects (Y. E. Kim et al., 2019). These spaces encourage students to synthesize knowledge across STEAM disciplines (Dougherty, 2012).

The State University of New York at Potsdam, in collaboration with Lockheed Martin, has developed an innovative STEAM program that combines studies in arts, humanities, and STEM fields to foster creative thinking and versatile professionals. This multidisciplinary approach aims to address complex global problems by providing students with a comprehensive education that integrates scientific expertise, artistic creativity, and problem-solving skills. The program includes hands-on workshops that focus on learning through real-world projects and creative thinking. Additionally, every student completes an internship, giving them the chance to use what they've learned in a real work environment. Finally, they carry out a capstone research project in their final year, where they apply their scientific knowledge to solve an actual problem. Students will proceed through their own Student-Initiated Integrative Major (SIIM). The curriculum includes an Interdisciplinary Major, which is a student-designed program that combines at least two different fields of study. It also features an Integrative Core, emphasizing problem-based, multidisciplinary learning that is embedded throughout the curriculum. In addition, students must fulfil General Education and liberal arts requirements, along with a selection of electives to complete their academic program (Madden et al., 2013).

Sarah Lawrence College in Bronxville has introduced a new program called Games, Inter-activity, and Playable Media, which aims to enhance technical and digital literacy within the Arts. Students are urged to integrate these digital project-based explorations into their broader studies in the humanities, such as literature, philosophy, politics, sociology, theatre, and writing. Analysing this statement highlights an emphasis on literacies and abstract competencies rather than on specific skills (Lewis, 2015).

Japan

The Empowerment and Informatics Program (EMP) at the University of Tsukuba was established in 2014 and is among the 62 programs chosen for Japan's Program for Leading Graduate Schools. As a relatively recent initiative, the EMP is one of the latest programs in Japan to adopt a STEAM education approach. This five-year Ph.D. program offers degrees in human informatics, which explores the creative integration of technology with human culture.

Despite EMP classification under information studies, focusing on information technology and engineering, it also incorporates perspectives from the humanities, social sciences, and arts, examining interaction of

technology with people. In present era of globalization and technological progress. The EMP acknowledges the technical expertise complemented by soft skills, which were earlier underrepresented in Japan's STEM higher education. Beyond technical expertise and specialization, the program stresses on a holistic student development approach, aiming to inculcate interdisciplinary, practical, and presentation skills. Initially, students engage in interdisciplinary courses to solve problems and solutions from diverse viewpoints, Human Informatics lies at the intersection of technology and humanity, necessitating skills for the human-centred Society. Practical skills focus on the need for learnings to academic success into immediate workplace applicability after completion university education (Yamada, 2021).

Finland

Higher education system IN Finland, comprising universities and universities of applied sciences (UAS), integrates STEAM education to interdisciplinary skills and innovation. Universities emphasize on research-based education in STEAM, while UAS focuses on practical, industry-oriented programs, incorporating arts to promote creativity (Fulbright Finland Foundation, 2025). STEAM curriculum is designed to develop problem-solving and critical thinking, aligning with Finland's emphasis on equity and lifelong learning (CCE Finland, n.d.). Universities of Helsinki offer programs combining technical disciplines with creative approaches, preparing students for diverse careers opportunities (Salmela-Aro, 2020). The Finnish National Core Curriculum promotes interdisciplinary, project-based learning, which extends into higher education through collaborative projects and innovative teaching methods (CCE Finland, n.d.). Furthermore, the 'Arts' combination into STEM disciplines has resulted in innovative methods to balance technical and creative skill sets among graduates.

Australia

The integration of STEAM education in Australian university education has gained attention as a means to foster interdisciplinary learning and prepare students for a dynamic, innovation-driven workforce. The programs at institutions like the University of Adelaide have introduced initiatives such as the National Lending Library, which provides access to digital technologies and lesson plans aligned with the Australian Curriculum, supporting STEAM integration across educational levels (Department of Education, Australian Government, 2025).

South Korea

South Korea introduced STEAM in 2011 as part of its "creative convergence education" initiative, incorporating 'Arts' into STEM to address low student interest in science and mathematics despite high achievement. A university of South Korea conducted a study on development and assessment of an H-STEAM (Humanities with STEAM) model to promote holistic learning among undergraduate students learning English as a Foreign Language (EFL students). The study included various group activities based on project-based learning to develop collaborative and conceptual learning both inside and outside the classroom setting. The results suggested that the H-STEAM model can be effective fostering openness and community caring abilities among students. The integration of collaborative and conceptual learning through PBL learner's autonomy contributing to deep learning. The study proposed a roadmap for developing H-STEAM models for higher education (Lee, 2021).

Universities collaborate with the Korea Institute/Foundation for the Advancement of Science and Creativity (KOFAC) to construct STEAM programs (Kang, 2019). Research resulted in improved student attitudes toward STEAM, with enhanced awareness and commitment to interdisciplinary learning (Kim, 2016). The success of these programs is evident in the overall student outcomes, as graduates have consistently demonstrated skills in both technical and creativity domains.

Russia

The Russian Federation presents a list of STEAM bachelor, master, and specialist programs offered at universities in Russia. These programs include 113 programs across various fields such as mathematics, informatics, computer engineering, radio engineering, electronics, journalism, fine arts, designing, linguistics, humanities, culture, and more branches of academics. These STEAM programs aimed to develop skills like digital literacy, computational thinking, creativity, soft skills, and others that are important for the modern digital economy. The research revealed that the practical implementation of STEM and STEAM technologies can improve the quality of training for the purposes of the digital economic upliftment in Russia (Shukshina et al., 2021).

Analysis

The analysis reveals that universities can offer STEAM-focused electives or minors, allowing students to combine disciplines like computer science with visual arts or engineering with music. This aligns with the "low floor, high ceiling, wide walls" approach, enabling diverse entry points for students to engage in interdisciplinary learning. (Gadanidis, 2014). At the university level, students might work on projects like designing sustainable technologies with aesthetic elements, fostering collaboration and innovation (Jia et al., 2021). However, challenges such as limited resources and high selectivity in tertiary education can constrain STEAM program implementation (Salmela-Aro, 2020).

STEAM programs emphasize more brainstorming, hands on learning which can enable students to understand and utilize theoretical concepts into practical applications. For instance, NASA's STEAM Innovation Lab collaborates with universities to provide resources like STEM videos and datasets, enabling students to apply interdisciplinary skills to space science projects (ISTE, 2023). STEAM programs are process-driven and designed to encourage experimentation, allowing students to develop digital skills while exploring a variety of new media forms and technologies.

Strategies for Implementation of STEAM based Multidisciplinary Framework

Implementing STEAM education in higher education under the multidisciplinary framework of NEP- 2020 requires a strategy with the policy's vision of holistic, flexible, and innovative learning. NEP-2020 envisions multidisciplinary education, flexibility in curriculum design, and the development of global skills such as critical thinking, creativity, and problem-solving, which align closely with STEAM's interdisciplinary approach. Below is an outline of five key strategies towards STEAM integration in higher education within the NEP-2020 framework:

1. Advanced curriculum design
2. Project-Based and Experiential Learning
3. Institutional Transformation

4. Holistic Skill Development
5. Assessment and Evaluation

1. Advanced Curriculum Design

NEP-2020 has introduced a flexible curriculum allowing students to combine subjects across disciplines (Ministry of Education, 2020). Higher education institutions (HEIs) can design programs integrating STEAM enabling creative combinations like data science with visual arts or engineering with design thinking. Courses could include projects blending coding (technology) with graphic design (arts) to create user-friendly applications (Sharma & Yarlagadda, 2018). Choice based credit system provides students to earn credits through diverse modes, including physical, online, or open-distance learning (UGC, 2021). HEIs can offer STEAM-focused elective courses or minors, such as "Creative Coding" or "Art with AI and digital technology" to encourage transdisciplinary learning.

Multiple entry and exit options **(**e.g., certificate after one year, diploma after two years, degree after three or four years) can support STEAM by giving platform to students to explore interdisciplinary skills at various stages i.e. students could earn a diploma or degree combining Science and Arts disciplines before pursuing a specialized degree.

2. Project-Based and Experiential Learning

STEAM education emphasizes hands-on, inquiry-based learning, aligning with NEP-2020's focus on experiential education. HEIs can implement PBL through interdisciplinary projects, such as designing sustainable creative solutions integrating engineering, environmental science, and aesthetics. These kinds of projects foster creativity, collaboration, and problem-solving. STEAM projects can give innovative solutions to real-world problems and serve the globe through students' collaboration from diverse academic fields, developing eco-friendly technologies or using data visualization (arts and mathematics) to scientific findings (Yakman, 2008).

As NEP-2020 promotes internships and industry collaborations (Radziwill et al., 2015), HEIs can form learning collaborations with industries to develop STEAM-based internships where students apply interdisciplinary and transdisciplinary skills, such as using AI (technology) and design (arts) to innovate in product development.

3. Institutional Transformation

Transforming HEIs into large, multidisciplinary universities and colleges by 2030 can establish dedicated STEAM departments or centres combining STEAM promoting cross-departmental collaboration (Bequette & Bequette, 2012) in an organised way that STEAM research centre could focus on transdisciplinary innovation, such as robotics combined with performing arts for interactive installations. Implementing STEAM requires faculty training in interdisciplinary pedagogy, so HEIs should conduct workshops, seminars to equip educators with STEAM methodologies, using PBL effectively (Henriksen, 2014).

NEP 2020 advocates for technology integration in education. HEIs can invest in makerspaces, digital labs, and art studios to support STEAM activities, enabling students to experiment with tools like 3D printers or virtual reality for interdisciplinary projects (Peppler & Bender, 2013).

4. Holistic Skill Development

STEAM education can share NEP-2020's goal of developing cognitive, social, and emotional skills. Incorporating Arts into data analysis (mathematics) can improve students' ability to present complex information effectively (Land, 2013). STEAM's inclusive framework can ensure inclusion of all students, those from marginalized communities**,** engage through creative and hands-on learning (Ministry of Education, 2020; Yakman, 2008). HEIs can use digital platforms to make STEAM courses accessible to all, addressing barriers such as lack of infrastructure and language challenges.

STEAM education has the potential to develop students' learning motivation and project competencies (Utaminingsih et al., 2023). STEAM education is beneficial in building **human resources** who can create a harmonious world and have global competencies.

5. Assessment and Evaluation

The policy 2020 shifts learning assessment from rote to continuous comprehensive evaluation, suiting STEAM's focus on skills like creativity and problem-solving skills (Ministry of Education, 2020). HEIs can assess STEAM projects through portfolios, presentations, or experiments rather than traditional exams, reflecting students' interdisciplinary abilities (Quigley & Herro, 2016). The National Higher Education Qualifications Framework (NHEQF) has classified qualifications based on learning outcomes, where STEAM programs can align with the development of analytical skills, innovation, and interdisciplinary collaboration (UGC, 2021).

Conclusion

The amalgamation of STEAM and multidisciplinary curriculum and in higher education can extend beyond individual students to encompass broader societal benefits empowering students to pursue their educational aspirations on their own terms, fostering a culture of lifelong learning and adaptability in higher education. This framework can allow students to explore multidisciplinary, interdisciplinary fields, and transdisciplinary fields to pursue the subjects of their interest and engage in practical experiences such as internships, research projects, and entrepreneurial skills creating a learner-centric ecosystem in higher education. As a result, students can think critically, creatively, independently, and collaborate across disciplines. STEAM if implemented in university education and research, it can create pathways which can be boon in generating new career opportunities for graduates. Also, STEAM can open up a wider set of learning approaches (e.g., performing or visual Arts for Mathematics and Sciences) and knowledge sharing methods between the various arts and science faculties. Authentic, real-world tasks can lead to deeper understandings within and beyond

assignment/project tasks. Additionally, international initiatives such as study abroad programs, exchange partnerships, and global research collaborations provide students with opportunities to innovations, different perspectives, and accommodate themselves in new cultures, leading to an interconnected world.

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