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PREPARING TEACHERS FOR MULTIDISCIPLINARY CLASSROOMS: PROPOSED INTERVENTIONS IN PRE-SERVICE TEACHER EDUCATION PROGRAMS

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Abstract

The shift toward multidisciplinary education, as envisioned by the National Education Policy (NEP) 2020, necessitates a transformative approach in pre-service teacher education to prepare future educators for diverse, integrated classrooms. It emphasizes the importance of developing competencies such as critical thinking, collaboration, inclusive classroom management, and the integration of arts, sciences, and vocational education along with digital technologies and blended learning in supporting multidisciplinary teaching. As education shifts toward holistic, interconnected learning experiences reflecting real-world complexity, teacher education programs must adapt to equip future educators with the skills, mindsets, competencies and tools required to navigate and foster multidisciplinary learning. This paper explores the conceptual foundations, pedagogical strategies, and curricular frameworks essential for preparing pre-service teachers for multidisciplinary classrooms. Through document analysis and a review of national and global literature, it examines current approaches to teacher education. The aim is to contribute to reimagining 21st-century teacher education to develop competent educators for diverse learning environments.

Key Words: NEP 2020, Pre-service Teacher Education, Multidisciplinary classrooms, Integrated Curriculum and Pedagogy, Teacher competency.

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Introduction:

In recent years, there has been a global shift in educational philosophy towards multidisciplinary and integrative learning. This transformation is driven by the recognition that 21st-century challenges such as climate change, public health crises, technological disruption, and social inequality are complex, interconnected, and cannot be adequately addressed through single-disciplinary approaches. So far, school education and teacher education have taught their students in strict disciplinary boundaries and the scope of exploration across disciplines has been very less. Observing this limitation in the field, the National Education Policy (NEP 2020) has emphatically stressed the importance of multidisciplinary education in the country. As a part of implementation of the policy, many changes are underway in the school education and a strong need has been felt to reimagine pre-service teacher education programs as well. As teachers are the foundation stone of implementation of any change in education, this is crucial to rethink, replan and reconceptualize teacher education curriculum and pedagogy to equip pre-service teachers with necessary skills and competencies to teach in multidisciplinary classrooms. This way future educators will not only be subject experts but also the integrators of knowledge who are capable of nurturing well-rounded learners for a rapidly evolving world.

Multidisciplinary Classrooms

Multidisciplinary classrooms are educational environments where learning transcends traditional disciplinary boundaries by integrating concepts, skills, and methodologies from multiple subject areas. This approach promotes holistic understanding, enabling students to connect knowledge across domains and apply it to complex, real-world problems. According to Beane (1997), multidisciplinary education involves combining theories and methods from several disciplines around central themes, encouraging meaningful connections and deeper learning. Drake and Burns (2004) emphasize that such classrooms support student engagement through integrated curricula that break down subject silos, promoting collaboration and critical thinking. Similarly, Jacobs (1989) highlights that multidisciplinary classroom facilitate cognitive flexibility by exposing learners to diverse perspectives, thereby enhancing problem-solving abilities. Furthermore, the OECD (2019) emphasizes the importance of multidisciplinary learning in preparing students for future challenges by developing skills such as systems thinking, creativity, and adaptability across

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contexts. “From an innovation standpoint, multidisciplinary classrooms support knowledge recombination, which research shows enhances creativity and innovation outcomes by blending diverse epistemic frameworks.” (Lyu, Huang and Liu, 2025)

NEP 2020

The National Education Policy (NEP) 2020 of India places strong emphasis on multidisciplinary and holistic education at all levels of schooling and higher education. It envisions an education system having learning, no longer confined to rigid disciplinary boundaries with a seamless integration of multiple subjects to foster a well-rounded intellectual and practical understanding among learners. Key aspects of multidisciplinary education in the policy include flexible curricula allowing students to choose subjects across disciplines—arts, sciences, humanities, and vocational fields according to their interests and aptitudes, thereby enabling them to experience a personalized, interconnected and holistic learning in their lives by nurturing critical thinking, creativity, and problem-solving skills. “The policy highlights teacher preparation as an activity that requires multidisciplinary perspectives and knowledge, formation of dispositions and values, and development of practice under the best mentors. It calls for the teachers to be grounded in Indian values, languages, knowledge, ethos, and traditions including tribal traditions, while also being well- versed in the latest advances in education and pedagogy.” (Para 15.1, NEP 2020) Here, it is important to understand that the concept of multidisciplinary education is tied to the goal of holistic development with integrated cognitive, emotional, social, physical, and ethical aspects of learning, preparing students not only for employment but also for life as informed and responsible citizens. For this, the policy stresses the need to revamp teacher education programs.

Integrated Teacher Education Program (ITEP) Curriculum Framework-2023

The ITEP Curriculum Framework–2023, introduced as a follow-up to NEP 2020 (Clause 15.5 & 15.6), establishes a four-year integrated B.Ed. as the minimum qualification for teachers by 2030. This dual-major bachelor's degree combines Education with a disciplinary or interdisciplinary subject, structured through a flexible, tri-dimensional model and stage-specific specialization. The programme integrates disciplinary and pedagogical knowledge while emphasizing experiential, inclusive, and interdisciplinary approaches to prepare future-ready teachers. It aims to build

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essential skills such as critical and creative thinking, problem-solving, communication, and ethical reasoning. Student-teachers choose a specialization aligned with school stages (Foundational, Preparatory, Middle, or Secondary), enabling them to design integrated, cross-subject learning experiences. The curriculum includes internships, community engagement, and inclusive education to ensure teachers are equipped to meet the diverse needs of learners in 21st-century classrooms.

ITEP Stage Specific Syllabus w.r.t. Multidisciplinary Education

The stage specific ITEP syllabus promotes multidisciplinary education by integrating a dual-major structure that combines a core focus on educational theory and pedagogy with a specialization in a chosen subject area such as science, mathematics, social science, or the arts. It supports integrated learning, allowing future teachers to design and deliver holistic, inclusive, and interconnected educational experiences suited to diverse school levels.

The **Foundational Stage** promotes multi-disciplinarity by integrating cognitive and non-cognitive domains for holistic development. Literacy and numeracy are taught through storytelling, music, play, and daily activities, avoiding subject silos. Arts, drama, and movement enhance creativity and cognitive growth. Health and nutrition add interdisciplinary awareness essential for child well-being. Reflective practice and beginner research skills are key in teacher preparation. Multilingualism and cultural traditions enrich learning, fostering inclusive and context-based pedagogy.

The **Preparatory Stage** shifts from play-based to structured, flexible learning that integrates multiple domains. Subjects like literacy, math, environmental studies, arts, and physical education are taught cohesively. Environmental Studies blends science, social studies, and health, promoting holistic understanding. Project-based learning connects themes like environment with art or language. Multilingual education fosters linguistic and cultural diversity. STEM is linked with arts, encouraging creativity and cross-disciplinary thinking.

The **Middle Stage** introduces formal subject learning while maintaining interdisciplinary connections. Subjects like math, science, and social studies are taught with an emphasis on their interrelatedness. Themes such as sustainability link science, ethics, and social issues. Project-based

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learning fosters collaboration, critical thinking, and real-world problem-solving. Higher-order skills like analysis and synthesis rely on cross-disciplinary knowledge. Technology integration supports this approach through digital tools, simulations, and data analysis.

The **Secondary Stage** offers subject specialization while sustaining a multidisciplinary focus aligned with NEP 2020. Learner's study advanced content in sciences, humanities, arts, and vocational fields with integrated project opportunities. Themes like climate change blend biology, ethics, and geography, enriching understanding. Flexible subject choices support holistic learning and diverse interests. Higher-order thinking, creativity, and problem-solving strengthen cross-disciplinary connections. 21st-century skills like digital literacy and global citizenship are embedded throughout the curriculum.

Multi-disciplinarity in Present Teacher Education Programs: Understanding the Field

Despite increasing recognition of the importance of multidisciplinary education, teacher education programs continue to face several structural and pedagogical challenges in preparing teachers for such classrooms. A primary issue is the compartmentalized nature of teacher training curricula, which are often discipline-specific and do not foster cross-disciplinary thinking or instructional strategies (UNESCO, 2021). Most pre-service teachers are trained within rigid subject boundaries, limiting their ability to design or implement integrative lessons. Additionally, teacher educators themselves often lack the exposure or expertise needed to model or mentor interdisciplinary pedagogies, creating a critical gap in professional development (Darling-Hammond et al., 2020). The absence of experiential learning opportunities—such as co-teaching or thematic practicum experiences—further hinders pre-service teachers from engaging in real-world, multidisciplinary instructional planning. Moreover, institutional inertia and regulatory frameworks often prioritize standardization and exam-centric teaching over creative, cross-disciplinary innovations (Singh, 2023). Therefore, systemic reforms, including curriculum redesign, faculty collaboration, and policy-level incentives, are essential for teacher education to produce professionals capable of meeting the demands of future-ready, multidisciplinary classrooms.

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Current challenges in teacher education

i. Systematic Barriers: In pre-service teacher education programmes, systemic barriers significantly constrain the development of multidisciplinary classrooms. Institutional resistance to pedagogical innovation often results in the continued reliance on traditional methods of teacher preparation (Altbach, 2015). Accreditation and regulatory frameworks emphasize compliance with established norms rather than encouraging curricular flexibility (NCTE, 2021). Additionally, teacher educators within these programmes are not always adequately equipped or willing to embrace new approaches, limiting experimentation and reforms (Sharma, 2020).

ii. Curriculum Rigidity: The pre-service curriculum is often highly structured and compartmentalized, making it difficult to incorporate interdisciplinary perspectives. The rigidity reduces the relevance of teacher preparation to the demands of contemporary education. Consequently, prospective teachers may graduate with limited capacity to address the complex and interconnected challenges of real classrooms (Darling-Hammond, 2017). Post NEP 2020, The ITEP curriculum and syllabus have addressed this curriculum rigidity by incorporating flexible, interdisciplinary learning courses and promoting the integration of multiple subjects, encouraging holistic understanding and real-world application. Collaborative teaching strategies have been emphasized to foster multidisciplinary perspectives.

iii. Lack of mentorship for multi-disciplinary pedagogies: A significant challenge in pre-service teacher education is the lack of structured mentorship to support multidisciplinary pedagogies. While curriculum frameworks such as NEP- 2020 and NCFFS-2022 advocate for integrated, theme-based, and learner-centered approaches, many teacher trainees struggle to translate these ideas into practice due to limited guidance from experienced mentors. Teacher educators themselves often have disciplinary silos in training, which restricts their ability to model cross-disciplinary teaching strategies or mentor prospective teachers effectively (Sharma & Kumar, 2019). Studies also emphasize that without systematic mentorship, trainees face difficulties in building reflective practice and pedagogical confidence, ultimately weakening the goals of innovation in teacher preparation (Darling-Hammond, 2017). Developing robust

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mentoring structures is therefore essential for fostering innovation, reflective practice, and confidence among pre-service teachers in adopting multidisciplinary approaches.

iv. Lack of Interdisciplinary Faculty Training: A key challenge within pre-service teacher education programmes is the limited interdisciplinary preparation of faculty members. Most teacher educators are specialists in narrowly defined domains, which restricts their ability to design and deliver integrative content (Sharma & Kumar, 2019). While opportunities for professional development focusing on cross-disciplinary collaboration and pedagogy remain insufficient (UGC, 2021), the faculty often resist collaborative teaching models due to entrenched disciplinary identities and workload concerns. This lack of exposure to interdisciplinary practices ultimately prevents teacher educators from modelling the integrative approaches that pre-service teachers are expected to adopt in their future classrooms (NCF-FS, 2022).

v. Compartmentalized Assessments: Assessment structures within pre-service programmes continue to reinforce compartmentalized learning. Evaluations are designed to test subject-specific mastery rather than the ability to apply knowledge across disciplines (Darling-Hammond, 2017). Written examinations emphasize reproduction of content rather than critical, creative, and problem-solving skills in authentic contexts (NCF-FS, 2022). Competencies such as collaboration, intercultural sensitivity, and adaptability—which are central to multidisciplinary classrooms—are rarely assessed (OECD, 2018). As a result, pre-service teachers receive limited feedback on their ability to work in integrative ways. Such assessment practices discourage innovation and weaken the transformative potential of pre-service teacher education (NEP-2020).

vi. Resource Constraints: Bringing multi-disciplinarity into pre-service teacher education faces several resource-related challenges including limited funding often restricts access to diverse teaching materials needed for interdisciplinary learning. There is a shortage of trained faculty capable of delivering content across multiple disciplines effectively. Inadequate infrastructure further hampers the ability to provide hands-on, cross-disciplinary learning experiences. Poor coordination and inefficiencies in resource sharing between departments add to the constraints. Technological limitations also reduce opportunities to implement innovative, interdisciplinary teaching methods that could enrich teacher training programs.

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vii. Resistance to Change: Traditional mindsets and resistance among educators and institutions to change pose significant barriers to adopting multi-disciplinarity. Many educators favour subject-specific teaching and are hesitant to move away from familiar, conventional methods. Institutional cultures often discourage innovation, making it difficult to introduce integrated approaches. Additionally, a lack of awareness about the benefits of multi-disciplinarity leads to scepticism and reluctance. Concerns about compromising academic rigor further fuel opposition.

Latest initiatives for implementation of Multidisciplinary education

The Government of India and its regulatory bodies have launched multiple initiatives to align pre-service teacher education with the vision of multi-disciplinarity articulated in recent education policy frameworks such as NEP, 2020, NCF-FS, 2022 and NCFSE, 2023. These initiatives seek to prepare teachers with integrated knowledge, skills and competencies required for the 21st-century classroom. NCTE has introduced several reforms beyond the ITEP to embed multi-disciplinarity in teacher preparation. One key step is the development of the National Professional Standards for Teachers (NPST, 2021), which outlines professional competencies across knowledge, skills, values, and dispositions, encouraging future teachers to engage with multiple domains beyond their subject specialization. NCTE has also initiated the Performance Appraisal, Outcome, and Monitoring Framework (PAOMF) to ensure that teacher education programmes integrate multidisciplinary perspectives and align with quality benchmarks. The introduction of the Academic Bank of Credits (ABC) provides flexibility for learners to earn and transfer credits across institutions and disciplines, thus encouraging cross-disciplinary exposure. UGC has also introduced Guidelines for Transforming Higher Education Institutions into Multidisciplinary Institutions (2020) and recommended that existing institutions gradually transform into multidisciplinary by 2030.

Suggestions for the Effective Implementation

In alignment with the vision of the National Education Policy (NEP, 2020) for holistic, flexible, and integrated approaches to teacher preparation, these measures emphasize the importance of equipping educators with the skills, pedagogies, and reflective practices necessary for 21st-century classrooms. Furthermore, they resonate with global frameworks such as UNESCO's Global

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Education 2030 Agenda and OECD's Learning Compass 2030, which emphasizes interdisciplinarity, competency-based learning, and global citizenship as essential dimensions of teacher preparation. By situating these suggestions within both national and international policy discourses, pre-service teacher education can be reimagined to develop educators who are not only grounded in disciplinary expertise but also capable of addressing complex, interconnected challenges in diverse educational contexts. These are:

i. Continuous Professional Development (CPD) for Faculty

To ensure the effective implementation of multidisciplinary pedagogy in pre-service teacher education, continuous professional development (CPD) for faculty is critical. Faculty members must be equipped with skills to integrate knowledge across disciplines, adopt learner-cantered approaches, and embed emerging areas such as environmental education, digital pedagogy, and global citizenship into their teaching. Professional development programs should emphasize collaborative learning, reflective practice, and technological integration. Both the NEP 2020 and the National Council for Teacher Education (NCTE) highlight the necessity of upskilling teacher educators to align with a holistic and multidisciplinary framework (NEP- 2020, NCTE- 2021).

ii. Strengthening Field-Based Experiences

Field-based experiences provide an authentic space for teacher trainees to observe and practice multidisciplinary pedagogy. Embedding school internships and practicum activities that integrate knowledge from diverse subject areas—such as language, mathematics, science, arts, and social studies—offers trainees opportunities to witness interconnected teaching in practice.

iii. Integrative Projects and Portfolios in Evaluation

Traditional compartmentalized assessments often fail to capture the complexity of multidisciplinary learning. Incorporating integrative projects, portfolios, and cross-disciplinary problem-solving tasks into pre-service evaluation ensures that teacher trainees demonstrate applied knowledge and creativity. This shift aligns with the PARAKH model of assessment under NEP 2020 and the NFSE 2023, which advocate competency-based, holistic, and multidimensional evaluations. Portfolios and project-based assessments also encourage reflective practice, collaboration, and the application of theory to real-world educational contexts (NCFSE, 2023).

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iv. Cultural Relevance and Multilingualism

Multi-disciplinarity emphasizes cultural relevance and multilingualism. The integration of local knowledge, traditions, and languages strengthens the cultural fabric of learning while supporting inclusivity. NEP 2020 advocates the three-language formula and encourages pedagogy rooted in India's diverse knowledge traditions. By fostering respect for cultural diversity and multilingual practices, pre-service teacher education equips future teachers to connect meaningfully with their learners' social and linguistic contexts.

Concluding Remarks

The evolution of pre-service teacher education toward a multidisciplinary model marks a pivotal step in transforming India's educational landscape. Rooted in the vision of NEP 2020 and reinforced by frameworks like NCF-FS 2022 and NFSE 2023, the shift calls for a departure from rigid subject boundaries and a move toward integrative, learner-centred pedagogy. By embedding interdisciplinarity into the curriculum, pedagogy and assessment, teacher education institutions are now positioned to cultivate educators who are not only well-versed in subject matter but are also reflective, culturally responsive, and equipped to navigate complex, real-world classroom dynamics. However, this transformation is not merely curricular, it demands systemic change. Faculty development, institutional reform, and collaborative policy implementation are essential in bridging the gap between vision and practice. The success of this transition hinges on designing pre-service education that integrates thematic, project-based, and experiential learning, supported by a strong foundation of continuous faculty development and institutional alignment. This will help India truly prepare a generation of teachers who are not just subject experts, but holistic educators ready to lead 21st-century classrooms with purpose and adaptability.

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