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In This Issue

Culture of Collaborations on Campuses: Need of the Hour

H A Ranganath*

"In the long history of humankind (and animal kind, too) those who learned to collaborate and improvise most effectively have prevailed."

Charles Darwin

The science of Evolutionary Biology illustrates the importance of competition, coexistence, coevolution, cooperation, collaborations, and such interactions among species in the sustenance and diversification of life forms on Earth. The present narrative aims to briefly capture the utility of academic interactions among different disciplines, institutions, campuses, and, more broadly, at the global level. This article focuses on the necessity of academic 'collaborations'.

Collaboration is the process of two or more individuals, entities, or organisations working together to achieve a common goal or complete a task. It involves sharing knowledge, skills, and resources to produce something greater than what any individual could achieve alone. Tapping the distributed expertise, experience, and intelligence of a group increases the chances of solving problems more efficiently. Essentially, it's a partnership where people cooperate and contribute to a shared outcome. For me, collaborations promoting cross-talk among different disciplines are an intellectual endeavour.

Success Stories of Collaboration

Tapping the distributed intelligence of a group increases the chances of solving problems more efficiently. These collaborations may involve interdisciplinary, Multidisciplinary, and Transdisciplinary interactions. One of the best examples is the management of the COVID-19 pandemic, which was also labelled as an international multidisciplinary collaboration. This pandemic served as a real-time competition between humans and COVID-19. The disciplines contributed to this success story are Microbiology, Virology, Molecular Biology, Genome Biology, Health Sciences, Immunology, Vaccine Research, Genetics and life history traits of new mutant variants, Evolutionary-biology, Epidemiology, Human Resource Management, Infrastructure, Requirements of hospitals, Pandemic Biology: waves, Lockdowns, Sociology, Psychology, Education, Economics, Modelling-Prediction, Technology, Policy decisions to name a few.

Another example is the contributions of multidisciplinary studies to the present scenario of the field of Genetics and Genomics. Biology (started with Mendel's experiments with the

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pea plant), Bacteriology (DNA as hereditary material), Chemistry, Physics, Crystallography, Modelling, Mathematics, Informatics, Genetic Engineering, Ethics, Biotechnology, Synthetic Biology and Genomics, Data Science, Psychology, Political Science, Social Science, Paleontology-Paleo-genomics, Forensic Science, Economics, Anthropology, Judiciary, Pharmacology, Wildlife Biology, Health Science, Molecular Ecology, Agriculture, Philosophy, Speech and Hearing, Pandemic Genomics.

In fact, the relationship between disciplines involved in collaborations at all levels is bi-directional. The disciplines involved are growing/advancing, even establishing new territories. For example, a new domain called 'EconOmics' was born out of two disciplines, namely Genomics + Economics = EconOmics. {EconOmics: Nature Genetics 45: 715 (2013)}. The following facts underlie this development. In the US, the Human Genome Project is one of the largest scientific endeavours ever funded. US federal spending on the Human Genome Project and subsequent genomics research from 1990 to the end of 2012 totaled approximately $12.3 billion. According to the new economic report, federal funding for human genetics and genomics research hit $3.3 billion in 2019. The report found that every dollar invested in human genetics and genomics by the U.S. government has yielded a return of $4.75 in federal tax revenues. The human genetics and genomics field supports more than 850,000 jobs in the U.S. The report estimates the total economic impact of this field to be $265 billion in 2019. Thus, the new domain, namely 'EconOmics' is flourishing.

Another example is Genetics and Genomics in Social Sciences. The Russell Sage Foundation in the USA, in conjunction with the JPB Foundation, sponsors the *Summer Institute in Social-Science Genomics*. The purpose of this two-week workshop is to introduce graduate Students and beginning Faculty in economics, sociology, psychology, statistics, genetics, and other disciplines to the methods of social-science genomics—the analysis of genomic data in social science research. The program includes the interpretation and estimation of different concepts of heritability; the biology of genetic inheritance, gene expression, and epigenetics; design and analysis of genetic-association studies; analysis of gene-gene and gene-environment interactions; estimation and use of polygenic scores; as well as applications of genomic data in the social sciences.

Similarly, there are several instances of interdisciplinary studies in the humanities and social sciences, including behavioural sciences, which have contributed to better policy-making. Interdisciplinarity and Emergence of Public Policy: For example, Public Policy has emerged as an academic discipline encompassing various disciplines of social sciences like sociology, economics, public administration and others. Delon and Steelman (2001) argue that public policy programs were originally grounded in the ideal of "the integration of knowledge across disciplines."

Need for Collaborations for Teaching and Research in HEIs

At the time of independence in 1947, there were about 20 universities and 496 colleges accommodating about 0.2 million students (Cf. Pankaj Mittal et al., 2020). An increase in the demand for higher education has resulted in the rapid expansión of the education sector. This has resulted in the enlargement of the canvas of the 'Higher Education Institution Matrix' of our Country. The current spread is approximately 4 crores of students are enrolled in about 1,200 university-level HEIs and 45,000 colleges, along with over 1000 stand-alone institutions. We have entered the Transformative Age and, much like the Industrial Revolution (IR 4) before it, we can expect fundamental shifts in how we live, work and play. The Transformative Age will also change how we learn – and, along with it, the nature and role of higher education (Education 4). In the Transformative Age, our universities must continue to remain globally competitive. According to the Mercer | Mettl India Graduate Skill Index 2024, only 42.6% of Indian graduates are employable. The report cited a lack of practical skills, weak communication, and outdated curricula as key reasons behind the fall.

Factors Hindering the Performance of HEIs

Particularly, state-funded public universities and colleges, in a way the backbone of our higher education system, and are weekend to such an extent that they can no longer provide reasonable quality education. Universities lack perspective planning; severe shortage of overall funds and grants; succession strategy of faculty is missing, non-filling of sanctioned faculty positions, availability of faculty with expertise to sustain

research and teaching is dwindling, Impermeable interdepartmental barriers without interaction among Faculty; Courses and programmes are managed by temporary faculty severely impacting teaching and research; curriculum is almost frozen with cosmetic changes; new programmes and courses are without required specialized faculty and infrastructure; mostly market driven and also to project diversity of courses being offered; HEIs are no longer a home for scholars, thinkers and innovators, etc., Human resource in terms of experience and expertise, and infrastructure for teaching, learning and research are unequal in our institutions as of now.

Despite these shortcomings, students are awarded degrees and diplomas, only to end up as unemployable graduates. Needless to say, victims are (a) Disciplines/Subjects and (b) Students.

Yet another development that demands Interdisciplinary Collaboration is that many of the traditional programmes that were offering a holistic overview of the discipline are divided (split) into many programmes, defying holistic treatment. For example, subjects like Zoology and Botany have given rise to fields such as Applied Botany/ Zoology, Microbiology, Biotechnology, Genetics, Applied Genetics, Molecular Biology, Sericulture, Environmental Science, and Human Genetics, among others. These courses are being offered even at the graduate level. Similarly, Chemistry is split into Organic, Physical, Inorganic, Bioorganic, Industrial chemistry, Applied Sciences, etc., History into History and Archaeology, Ancient History and Archaeology, History and Epigraphy, etc., Political science has led to Political science & Public Administration, Political Science & International relations, International Studies, etc. At the institutional level, a few programs were transferred from multidisciplinary universities to new monodisciplinary universities, such as Health Sciences, Engineering, Physical Education, Folklore, Sanskrit, Law, Horticulture, Veterinary, and Music. The above list is not exhaustive; these are only a few examples, with many more being observed at the national level. Even the National Education Policy–2020 (NEP–2020) strongly recommends the establishment of multidisciplinary higher education institutions over monodisciplinary institutions.

Currently, a student admitted to a college or university must make do with the available facilities. Despite the constraints mentioned above,

students currently registered at one university cannot attend classes or courses offered at another university, unless an exchange programme exists between them. He/She is almost trapped/paralysed without mobility. This does a gross injustice to the academic potential of a candidate. Students and institutions have to make use of the provisions of the scheme, which is already implemented, namely the 'Academic Bank of Credits', to overcome the deficiencies and limitations of the institutions.

In the interest of students and the subjects/ disciplines that are being deemed to have taught and researched, the Higher Education system deserves rejuvenation. One of the strategies is 'Collaboration'.

Philosopher of Science Karl Popper (1963) famously observed, "We are not students of some subject matter, but students of problems. And problems may cut right across the boundaries of any subject matter or discipline." This statement has become increasingly relevant. Today, many of the phenomena and problems that we are trying to understand and solve indeed 'cut across' the traditional boundaries of academic disciplines. We are becoming increasingly aware that an integrated approach is necessary. Therefore, Teaching and Research are a collaborative enterprise.

Levels of Collaboration

The main objective of this is to promote interdisciplinary teaching and research in HEIs. To start with, (1) the rigid compartmentalisation of disciplines within different departments has to be replaced by a permeable, porous, transparent academic curtain to promote interdisciplinary interactions for teaching and research. (2) Interinstitutional–between universities; between university departments and Research Institutions; (3) National: Coordinated Projects with many institutions across the country (National perspective); (4) International: involving Research institutions/laboratories and/or Universities of different countries (global perspective), and (5) With Industries.

The strategic steps to be in place for a successful outcome, for example, (1) Involving experts from the collaborating institutions to revisit Undergraduate and Postgraduate teaching programmes, and identify new areas of research. (2) Training students-researchers who can transcend the barriers that exist between

the disciplines requires innovation in teaching and learning. (3) Enable students to participate in interdisciplinary courses and be exposed to research experiences that transcend the discipline of their major subjects; (4) Encourage Mobility of Students between disciplines and institutions. (5) Train the next generation of interdisciplinary researchers and researchers who are facile at participating in interdisciplinary teaming. (6) Training researchers to work at the interfaces of the disciplines.

In addition to these, universities have to address the challenges of the 'Transformative age'. As we have already experienced, the future of work will be radically different, driven largely by the machine economy. Robotics and machine learning take over repetitive and programmable human tasks, and artificial intelligence augments human roles. So, the question will be, when machines become workers, what do humans do? How will universities adapt to remain relevant for the future of work? What will our stakeholders —namely, parents, students, and employers —demand of our universities in the future? What will make a university successful in this new world?

To the best of my knowledge, except for a few institutions like the Indian Institute of Science, other HEIs are not equipped with the requirements to deliver holistic education to students. I am aware that institutions can't be self-sufficient to meet the expectations and aspirations of the stakeholders. Therefore, the remedy is to collaborate and cooperate with other HEIs for teaching and research.

Research through Collaborations

Realising the importance of collaborations, DST, Government of India's Anusandhan National Research Foundation (ANRF) has launched a new novel scheme called the 'Partnerships for Accelerated Innovation and Research' (PAIR) programme to transform research and innovation in Indian Universities. The PAIR programme is designed to cultivate research excellence across Indian universities, particularly central and state public universities with limited research capabilities, by fostering collaborations with top-tier institutions. The idea is to improve the research

ecosystem in our universities. More information is available at *https://www.anrfonline.in/ANRF/ PAIR?HomePage=New.*

International collaboration plays a significant role in the global ranking of universities. It has become a crucial factor for universities seeking to improve their global rankings. For example, the Times Higher Education Rankings, QS World University Rankings, and Webometrics Ranking of World Universities consider strong international research collaborations as one of the key criteria for institutions. By fostering strong international partnerships, universities can enhance their research impact, global reputation, and overall standing in the competitive landscape of higher education. It has been shown that International research collaborations, involving researchers from different countries working together on publications, are beneficial for advancing knowledge and addressing global challenges. The joint publications reflect the participation of multiple authors with diverse affiliations as well as multidisciplinary contributions. For example, in addition to premier research institutions such as IISc, BARC, TIFR, and IITs, the University of Delhi and Punjab University have successful collaborations with CERN (European Organisation for Nuclear Research) in France. UGC's initiatives, such as GIAN (Global Initiative for Academic Networks) and SPARC (Scheme for Promotion of Academic and Research Collaboration), promote long-term associations between Indian and foreign institutions. Such collaborations offer access to diverse expertise, resources, and perspectives, leading to higher quality and more impactful research with an increased Citation index.

Message

Collaborations are one of the strategies to meet the aspirations of students, to meet the fast-changing Graduate Outcome requirements, and also to facilitate the creation of new knowledge. It brings in new ideas, promotes innovations, and enhances the image of the institutions. The culture of collaboration has to be ingrained in the DNA of the institution.

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Biodiversity Conservation: From Planning (Seed) to Action (Organism)

N P Melkania*, Lalita Bisht** and Shivangi Tripathi***

For hundreds of years, humans have threatened the *"Mother"* Earth as someone does with a rental car. Instead of caring for the *"Mother"* Earth, humans have recklessly degraded/destroyed the Earth's resources, "biodiversity" in particular. We allow tropical rainforests to be burned, wetlands to be drained, coral reefs to be dynamited, rivers to be polluted, grasslands to be unattended, etc. Biodiversity, the result of four billion years of evolution, is the natural wealth of the world. It has great significance for its social, economic, cultural, and ethical values, and ecological values above all.

Biodiversity occurs even in the hot deserts, the tundra, or hot sulphur springs, because genetic diversity has allowed life to adapt to the harshest environments. For terrestrial ecosystems, the greatest biodiversity is centred on the tropics, particularly tropical moist forests. Oceans and coastal zones also contain a bewildering array of species. *"Biodiversity, truly, is a guardian resource."* We already know that biodiversity provides varied Ecosystem Goods and Services (EGSs). It secures species in the ecosystem, "*like a senior citizen*" in a human family of joint nature. It feeds us and our domesticated animals in the form of non-farm food (and forage) products, provides raw material for industries, parental lines for developing new varieties, and a source of medicines (Table 1), etc. The biodiversity-centric ecological services include carbon sequestration, seed dispersal agents (e.g., vegetarian piranhas Myploplussauron)*,* pollinators, gaseous exchange, water yield, grazing ground for domesticated livestock, aesthetic values, knowledge,

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and peace, etc. Loss of biodiversity means loss of all the EGSs (Chapin *et al.* 2000).

Can there be development without/at the cost of biodiversity? Can there be circulation of abiotic components in an ecosystem devoid of biodiversity? Can there be well-being of humans and existence of a healthy ecosystem in the absence of biodiversity? The answer to these questions seems to be "*no/none/ not certainly*". Conservation of biodiversity and its improvement is an essential part of development. But, before planning conservation of biodiversity, it is essential to know the status, functions, and factors or agents causing loss of biodiversity. Of course, monitoring of biodiversity regularly and measuring impacts of human activities on biodiversity are prerequisites for sustainability and conservation of biodiversity. We attempt to put forward, on the occasion of World Biodiversity Day 2025, the knowledge and experiences on these aspects for achieving people-centric biodiversity conservation.

What is Biodiversity?

Raymond F. Dasmann initially used the word "*Biological Diversity*" in the form of the English word "*Biological Diversity*" in 1968 in his book "*A Different Kind of Country*". W.G. Rosen was the first person to use the word in the form "*Biodiversity,*" changing it from "Biological Diversity". The word "*Biodiversity hotspot*" was first used by Norman Myers in 1988. Since the organisation of the United Nations Conference on Environment and Development (UNCED) in 1992 in Rio de Janeiro, Brazil (The Rio Summit or The Earth Summit), "biodiversity" has become a very common and fashionable word. It is used widely by the general public, environmental groups, donors, scientific community, conservationists, and industrialists, and has a very high profile in the political arena. It is now well-recognised that biodiversity includes much more than the mix of species. Wilson (1992) defined biodiversity to include "........*the variety of ecosystems, which comprises both the communities of organisms within particular habitats, and the physical conditions under which they live*." These organisms are central to ecosystem functions on

Table 1: Major Drugs Derived from Plants

Drug	Source Species	English Name	Use(s)
Atropine	*Atropa belladonna*	Belladonna	Anticholinergic
Caffeine	*Camellia sinensis*	Tea	CNS stimulant
Camphor	*Cinnamomum camphora*	Camphor	Rubefacient
Cocaine	*Erythroxylum coca*	Coca	Local anaesthetic
Codeine	*Papaver somniferum*	Opium poppy	Analgesic; antitussive
Colchicine	*Colchicum autumnale*	Autumn crocus	Antitumour agent
Digitoxin	*Digitalis purpurea*	Common foxglove	Cardiotonic
L-Dopa	*Mucuna deeringiana*	Velvet bean	Antiparkinsonian
Menthol	*Mentha* spp.	Mint	Rubefacient
Morphine	*Papaver somniferum*	Opium poppy	Analgesic
Quinine	*Cinchona ledgeriana*	Yellow cinchona	Antimalarial; antipyretic
Reserpine	*Rauvolfia serpentina*	Indian snakeroot	Antihypertensive
Scopolamine	*Datura metel*	Recured thornapple	Sedative
Strychnine	*Strychnos nux-vomica*	Nux vomica	CNS stimulant
Thymol	*Thymus vulgaris*	Common thyme	Antifungal

Source: *Wachtel et al. (undated)*

which the human species and its future welfare depend. The organisms are, thus, natural insurance capital for securing the generation of EGSs at present, and in the future (Barbier *et al.* 1994).

Wilson's definition of biodiversity is also a position taken by the "Convention on Biological Diversity (CBD)" of the UNCED 1992, signed by 168 nations. The official definition of "Biological Diversity (=Biodiversity)", approved by most countries in the context of world-wide negotiations, agreements, and strategies is "….the variability among living organisms from all sources including, interalia, terrestrial, marine and other aquatic ecosystems, and the ecological complexes of which they are a part; this includes diversity within species, between species, and the ecosystems (UN-CBD-UNEP 1992 Rio Summit)". The shortest definition of biodiversity is that of the Global Biodiversity Strategy (WRI, IUCN, UNEP 1992) which regards biodiversity as "the totality of genes, species, and ecosystems in a region".

What is Happening to the Biodiversity?

Globally, *the loss of biodiversity* through ecosystem modifications *is a new form of "transboundary pollution"*. We are engaged in the process of extinguishing species and their ecosystems at something like a 1000 times the natural rate. *Homo sapiens* (wise human!), this single species has the ability to alter the entire biosphere radically, and extinguish him-/her- self in the process. The major direct drivers of the loss of biodiversity globally include anthropogenic pressures broadly classified in five main types, viz., land- and sea-use changes, direct resource exploitation, invasive alien species (IAS), climate change, and pollution (Keck *et al.* 2025). The recent IPBES report (*https://www.ibpes.net/*)finds the IAS as a growing and costly threat worldwide to nature, economy, food security, and human health. They play a key role in 60 per cent of global plant and animal extinction, and cost humanity more than $ 400 billion a year. Increasing globalisation (Lenzen, *et al.* 2012) has facilitated the IAS arrival, and environmental changes, including anthropogenic climate change, facilitate the establishment of the IAS (Early *et al.* 2016). One sixth of the global land surface is now highly vulnerable to invasion in the native landscapes, including substantial areas in developing economies and biodiversity hotspots.

The invasion of plants, animals, and microbes has caused environmental threats to economies, too (Piemente, et *al.* 2000). The growth of IAS leads to homogenization, replacement of native species, and reduction in regional biodiversity. It is now realised that the threat to biodiversity by the IAS is the

second to that of habitat fragmentation. Based on a study of the tiger habitats across 20 Indian States, Mungi *et al.* (2023) recorded that in India, the IAS have invaded 22 per cent of the natural habitats owing to the legacy of anthropogenic modifications, and have the potential to reach up to 66 per cent of the green areas. It is estimated that managing invasions across the tiger ranges will cost as high as ~13.5 billion USD for one-time management.

The potential IAS species that threaten the native biodiversity include: *Lantana camara* and *Eupatorium Adenophora* (Kannan *et al.* 2013), *Ageratum conyzoides, Ageratum houstonianum, Eichhornia crassipes, Chromolaena odorata, Cyprinus carpio, Mikania micrantha, Mimosa diplotrica, Parthenium hysterophorus, Prosopis juliflora, Senna tora, and Xanthium strumarium* (Sharma *et al.* 2005, Melkania 2025). Organisms, viz., the South red-eared turtle *Trachemys scripta*, invasive bird- Red-vented Bulbul *Pycnonotus cafer*, invasive pest *Myoporum thrips,* and seaweed *Kappaphycusalvarezii* (that is smothering coral reefs in the Gulf of Mannar in Tamil Nadu) have also become the IAS of concern for native Indian biodiversity.

Eroding Biodiversity: India and Beyond

With respect to biodiversity, India is among the world's top 10 and Asia's top four countries. Having merely 2.4 per cent of the world's land, India has about 7–8 per cent of global species diversity, which includes 45,000 species of plants and 91,000 species of animals. India is one of the 17 megadiverse centres of the world. Only India has the world's only floating National Park – "Keibul Lamjao National Park" in Manipur. India has 10 biogeographic zones, and is home to 8.58 per cent of the mammals documented so far, with corresponding figures for bird species being 13.66 per cent, for reptiles 7.90 per cent, for amphibians 4.66 per cent, for fish 11.72 per cent, and for plants 11.80 per cent. Of the 34 global biodiversity hotspots, four hotspots, viz., the Himalayas, Indo-Burma, the Western Ghats – Sri Lanka, and Sundaland, are located in India.

But, due to burgeoning anthropogenic pressures and changes in the lifestyle of modern humans, India is now longer a haven for wildlife and biodiversity. Most updated estimates of the Indian Ministry of Environment, Forest, and Climate Change report 77 critically endangered wildlife species in India as of the year 2022. Of the nine mammal species considered as critically endangered, eight are endemic, viz., Hangul, Malabar Large Spotted Civet, Andaman Shrew, Jenkin's Shrew, Namdapha Flying Squirrel, Large Rock Cat, and Leafletted Leaf-nosed Bat. Big cats-Lion and Tiger- are also on the list of critically endangered species. Birds, such as, Great Indian Bustard, face threats from sources like power lines in Rajasthan, and often fail to garner the attention they deserve for their conservation. The recent report of the International Wildlife Welfare Organisation – "*Four Pauz*" revealed that the Leopard has lost 75 per cent of its natural habitat in Africa, West Asia, and Asia. The culture of Big Cat in South Africa is promoting international smuggling of parts of big cats for medicine, jewellery, decorations, and the use of skin in religious purposes. In the longest stretch of rivers Ganga and Brahmaputra, the population of turtle *Batagurdhongoka* [listed in Schedule I of the Indian Wildlife (Protection) Act, 1972] has declined by 80 per cent in the last 50 years due to trapping in fish nets, irregular flow of water in these rivers owing to dams, water pollution and smuggling. The population of Whale Shark, the biggest shark and fish on Earth, has declined more than 50 per cent in the past 75 years globally due to hunting for commercial uses, viz., oil, and fin soup. Kerry Institute of Ecosystem Studies reports the Hill Zebra as a critically endangered species in Africa. The African Wildlife Foundation has recorded a decline in the population of all three zebras by 54 per cent in the last 30 years in Africa due to habitat loss, decline in the carrying capacity of vegetation suitable for them, and illegal hunting.

About plant species, orchids – one of the varied and diverse groups of flowering plants of multiple use, such as ornamental, food value, and medicinal importance face a survival threat due to habitat destruction and overexploitation. Many species of orchids, e.g., *Aerides odorata, Dendrobium falconeri, Renanthera imschootiana*, and *Vanda coerulea,* have now come under threatened categories. Mangrove ecosystems, thriving in the native interface between land and ocean in tropical and sub-tropical tidal zones, characterized by their salt-tolerant vegetation, provide multitude of EGSs, such as, natural buffers, mitigate adverse impacts of waves and storm surges, prevent

erosion, stabilize coastal lines, and function as crucial nursery grounds for diverse marine fauna, including fishes, crustaceans and shellfish, and supporting local fisheries. Anthropogenic activities, such as coastal development projects for tourism and infrastructure, conversion of mangrove areas for shrimp aquaculture, agricultural encroachments, unsustainable bio-resource extraction practices, and rising sea-level owing to anthropogenic climate change, adversely impact to extent of the health of these mangrove ecosystems.

In regard to the arboreal giants, the IUCN reports that of the known 47,272 species of trees in the world, 16,425 species are facing danger of extinction. In South America, the home of the largest tree diversity, out of 13,668 species, 3,356 are facing the danger of extinction. In India too, the number of tree species is now declining along the roadside and agricultural landscape prominently on account of cutting for domestic needs by the villagers, extension of agriculture, expansion of roads, construction of highways/expressways, urbanisation, anthropogenic climate change, and diseases.

Disappointing reports also exist in regard to faunal species consequent upon anthropogenic climatic change. Michigan State University has reported a 22 per cent decline in the population of butterflies in America in the last two decades due to anthropogenic climate change, habitat loss, and excessive use of herbicides. National Institute of Amazonia, Michigan Technical University, and the University of Oregon study published recently in Journal *Science* revealed a decline by 63 per cent in the survival capacity of birds, and their reduced ability to fly, due to rising temperatures by just 1.0°C. Queensland University's research published in '*Current Biology'* indicated a rise in body temperature of crocodiles beyond 32-33°C, which is adversely affecting their survival ability, leading to an effect on reproduction. A week of the

Studies cited in Pimm, *et al.* (1995) have concluded that the historical low impact intrusion into species habitats for local demands of food, fuel and living space, and growing international trade along complex routes for demands of diverse communities (Lenzen, *et al.* 2012), are causing Earth's sixth major extinction event (Chapin, *et al.* 2000). Research of a team of scientists from the Department of Fish, Wildlife and Conservation

Biology of the Colorado State University and the Nature Conservancy, Virginia, published in the Journal *Scientific Data* on 10th April, 2025 provided most updated information on adverse impacts of human activities on the Earth, and its biodiversity. The study showed that by the year 2022, about 43 per cent of the Earth's land remained minimally modified, but 27 per cent had low, 20 per cent had moderate, and 10 per cent had high levels of modifications. The main driver of these changes was agriculture, which alone accounted for nearly 47 per cent of all modified land; other major contributors were transportation infrastructure (roads, railways, and power lines), human accessibility, and urban development.

A Look at Biodiversity Conventions and Legislation

Over decades, specialised conventions and institutional mechanisms have been established globally, regionally, and nationally, on biodiversity conservation (Table-2). Following these, the new institutions and rules for action have been established by the national government in India at the State, Union Territory and Central levels; the existing ones have been amended accordingly (Melkania and Pandey, 2024). The years 1972, 1987 and 1992 have been revolutionary for environmentalism, in general. Recognizing the significance of natural and domesticated ecosystems, and the interdependence of these, both terrestrial and aquatic (and semi-aquatic wetland), and associated biodiversity ranging from genetic to ecosystem through species of plant, animal and microbe, as the growth engine for diverse EGSs, India established policies, acts, rules, guidelines, and organizations concerning wildlife and biodiversity conservation. To make biodiversity conservation a movement/action of mass, the citizens, youth, planners, financers, and policy makers are awakened through activities like lecture, quiz, poster presentation, debate, photographs display, etc., on specific celebrations on Wetland Day (02 February), Mother Earth Day (22 April), Endangered Species Day (16 May), Biodiversity Day (22 May), and the World Environment Day (05 June), etc. The environment and natural resources degradation being a concern for all, appreciable partnerships have evolved globally, regionally, and nationally. The need of the hour in that these partnerships yield outcomes with a concern for humanity, respect for non-human

components of the ecosystem(s), and practice a "*share and care*" approach.

Monitoring Biodiversity and Measuring Impacts of Human Activities on Biodiversity

In recent times, biodiversity is measured by governmental institutions using techniques of Remote Sensing (RS) and Geographic Information Systems (GIS). In fact, the strengths of diverse organisations need to be utilised to monitor biodiversity democratically, and explore the realities of field conditions of causative factors of biodiversity loss, and the status of biodiversity. Therefore, it is essential to tap all possible sources of data and information, both governmental and non-governmental organisations, as well as the research community of higher educational institutions, including the citizen science of volunteer naturalists, citizens, and community members (The most community science schemes are found in India, South Africa, Australia, Europe, and North America). Synergies between the RS and scientist-executed monitoring programmes, and community science need to be developed and practised to enhance the monitoring of essential biodiversity variables.

Measuring the impacts of human activities on biodiversity in advance can save humanity and the economy from irreparable loss on account of the collapse of biodiversity. Biodiversity Footprint (BF)is a tool to measure all human activities' effects on nature/ biodiversity in one way or the other. It describes how much damage a product, consumer, municipality, or company causes to biodiversity. Positive BF means that the overall impact strengthens nature. Finland is currently the international research leader for developing BF measuring methods. The Sitra and S Group of Finland has funded a project at Jyväskylä University to calculate the BF of the entire S Group. The second project by Sitra and Jyväskylä University is the first in the world to examine the BF of individual consumer choices. The study is an attempt to examine how Finnish consumption influences nature, both in Finland and abroad, and what kind of sustainable everyday actions can reduce this burden (Miettinen, 2024).

To calculate the BF, it is essential to know what human actions are causing adverse impacts on biodiversity. The BF is caused by five factors or drivers of biodiversity loss identified by IPBES, i.e., human activities generating land- and sea-use changes, greenhouse gases emissions causing climate warming, pollutants affecting adversely the ecosystems (e.g., waste products leading to soil pollution; and N and P emissions causing eutrophication, etc.), direct exploitation of natural resources leading to depletion of living and non-living components, and spread of invasive alien species affecting ecosystem's functioning. Thus, a BF is the sum of these five pressures: how much of our measurable activities generate land- and sea-use, greenhouse gas emissions, pollution, overconsumption of natural resources, and the spread of invasive species. Every BF includes a carbon footprint out of five measures. No single method is yet available to capture all the other pressures cited above. The best available methods cover three or four out of the five drivers. The land- and sea-use change and climate change account for most of the average BF. In addition to the non-availability of a single method for measuring BF, the lack of people with adequate expertise to calculate BF is another bottleneck.

Priority for Biodiversity Conservation: Species or Ecosystem!

Unlike anthropogenic climate change issues, the malediction of biodiversity is primarily localised; therefore, emphasis needs to be given to address both climate change and biodiversity erosion challenges simultaneously. The aim of biodiversity conservation strategy should not be restricted to preserving as much of the genetic diversity and species as possible, but to conserve the capacity of ecosystems to continue to deliver life-support and other ecosystem services of value to humanity under a wide range of environmental conditions. So, switching the emphasis in biodiversity conservation beyond genetic information and preservation of the species for tourism and recreation in nature reserves, towards conservation for protection of ecosystem functions and resilience, is the need of the hour(Pimm *et al.* 1995). Recall that the role of biodiversity in the functioning of ecosystem performance is not limited to the " Protected Areas", e.g., National Parks; the conservation of biodiversity has to be addressed everywhere and anywhere. *The most powerful instrument for biodiversity conservation, therefore, is not a "park fence", but "economic policies and reforms" that make conservation a matter of private and social interest.*

**Table-2: Conventions, Institutions, and Legislation Established/Enacted for
the Conservation of Wildlife and Biodiversity**

[A] International	
1922	Bird Life International was founded with its headquarters in Cambridge, United Kingdom.
1945	The United Nations Food and Agriculture Organisation (FAO) was founded with its headquarters at Quebec City, Canada (re-located in Rome, Italy).
1948	The International Union for Conservation of Nature (IUCN) was founded with its headquarters at Gland, Switzerland.
1961	The World Wildlife Fund for Nature (WWF) was founded with its headquarters at Gland, Switzerland.
1971	UNESCO, under its Man and Biosphere (MAB)launched the concept of Biosphere Reserve (BR) for protecting representative ecosystems, contrary to the protection of species and habitats.
1971	Ramsar Convention for the conservation of wetlands of international importance) was adopted 02 Feb. at Ramsar, Iran (Headquartered at Gland, Switzerland).
1972	The United Nations Environmental Programme (UNEP) was founded as an outcome of the United Nations Conference on the Environment, Stockholm, Sweden.
1973	CITES (Convention on International Trade in Endangered Species of Flora and Fauna) (effective from 1975) was founded with its headquarters at Geneva, Switzerland.
1976	The wildlife trade monitoring network TRAFFIC was established with its headquarters at Cambridge, United Kingdom.
1980	IUCN, WWF, and UNEP published the World Conservation Strategy.
1990	IUCN, WWF, and UNEP published the World Conservation Strategy "*Caring for the Earth*".
1992	The Convention on Biological Diversity (CBD) was launched (and became effective in 1993) as an outcome of the Earth Summit (= United Nations Conference on Human Environment) in Rio de Janeiro, Brazil.
2000	The Cartagena Protocol on Biosafety was established in COP 5.
2000	Millennium Development Goals (2000-2015) were launched.
2008	The United Nations Conference on Biodiversity in Bonn, Germany, was organised.
2010	The Nagoya Protocol on genetic resources was established in CoP 10.
2011	The South Asia Wildlife Enforcement Network was started in Bhutan with its secretariat at Kathmandu, Nepal.
2012	The Intergovernmental Science Policy Platform on Biodiversity and Ecosystem Services (IPBES) was established in Bonn, Germany.
2015	Sustainable Development Goals (2015-2030) were launched.
2020	The Aichi Target for biodiversity conservation was established in CoP 10.
2022	The Kunming - Montreal Global Biodiversity Framework was established as an outcome of the 2022 United Nations Conference on Biodiversity (CoP 15).
[B] National	
1890	The Botanical Survey of India (BSI) was established for taxonomical and floristic studies on wild plant resources with its headquarters at Shibpur, Howrah, West Bengal.
1916	Zoological Survey of India (ZSI) was established for taxonomical studies and faunal surveys on wild animal resources with its headquarters at Kolkata, West Bengal.
1952	The Indian Board of Wildlife was founded.
1960	The Prevention of Cruelty to Animals Act was enacted.
1962	The Animal Welfare Board of India was established in Chennai, Tamil Nadu.
1972	The Wildlife (Protection) Act was enacted (amended in 2002, 2006, and 2023).

1978	The National Museum of Natural History was founded in New Delhi for the awareness of nature and the environment.
1979	The Biosphere Reserve Programme was initiated by setting up a "Core Advisory Group of Experts".
1981	Forest Survey of India (FSI) was established for the assessment of forest resources of India with its headquarters at Dehradun, Uttarakhand.
1983	Launched the first Wildlife Action Plan1983-2001, followed by 2002-2016, and 2017-2031.
1985	The Union Government of India established an umbrella organisation Ministry of Environment and Forests (renamed as the Ministry of Environment, Forest and Climate Change in 2014), for overseeing the implementation of India's environment, wildlife and forest policies and programmes.
1986	Wildlife Institute of India was established at Dehradun, Uttarakhand, for education, research and training in wildlife.
1987	The National Wetland Conservation Programme was launched.
1987	National Plan for Conservation of Aquatic Ecosystems was initiated.
1988	Gobind Ballabh Pant Institute of Himalayan Environment and Development (renamed as Gobind Ballabh Pant National Institute of Himalayan Environment) was established at Almora, Uttarakhand.
1991-92	The Biodiversity Conservation Scheme was initiated to coordinate among various agencies dealing with the conservation of biodiversity.
1991-92	Project Elephant was announced.
1992	The Central Zoo Authority was established.
1992	The National Conservation Strategy was launched.
1994	India ratified the CBD 1992.
1998	Wildlife Trust of India was established as a Non-Governmental organisation.
1999	The National Action Plan on Agro-biodiversity was launched by the NAAS, ICAR and ISPGR.
1999	The National Biodiversity Strategy and Action Plan was launched.
2001	The Protection of Plant Varieties and Farmers' Rights Act was enacted by the Ministry of Agriculture, GoI.
2002	The Biological Diversity Act was enacted (amended in 2023).
2003	Biological Diversity Rules were published.
2004	ENVIS (Environmental Information System) was established in the Ministry of Environment and Forests, GoI.
2005	The National Tiger Conservation Authority (NTCA) was founded.
2006	National Environmental Policy was launched.
2007	The Wildlife Crime Control Bureau was established.
2008	The National Biodiversity Action Plan was launched (amended in 2014).
2010	The Central Wetland Regulatory Authority (CWRA) was established.
2010	The National Green Tribunal (NGT) was established in New Delhi as a green court.
2011	The National Centre for Marine Biodiversity was established in Jamnagar, Gujarat, under a Public-Private Partnership mode.
2017	The Wetlands (Conservation and Management) Rules were published.
2020	Project Lion and Project Dolphin were announced.
2021	The Biological Diversity Bill was amended.
2021	The National Human-Wildlife Conflict Mitigation Strategy was launched for 2021-2026.

Epilogue

In January 1989, *Time* magazine revised its *"Man of the Year" theme* to emphasise the year of "*Endangered Earth*". It pointed out humankind's reliance on natural ecosystems, and condemned thoughtless destruction of natural resources by the anthropogenic activities on account of *behavioural change, i.e., need to greed through want/desire*. We humans of anthropocene age need to join *Time* in asking ourselves what we are doing to our "mother" Earth and "guardian" biodiversity. As biodiversity is crucial for human livelihood and human survival, *we need to mind our behaviour and action proactively*. Unless we think about fundamentals, our specific measures may produce new (yet unknown) backlashes more serious than those they are designed to remedy.

None of us is as strong as *all* of us. So, seek the strength of *All*, and promote the population of diversity-sensitive humans of all ages, genders, economies, social strata, and knowledge streams. As we come to the end of this synthesis, we quote Leo Tolstoy - "*Everyone thinks of changing the society/world, but no one thinks of changing him-/her-self*". *So, change (y) ourselves, which is possible*. The "*door*" is there, and the "*key*" is in (y)our hand. We conclude this synthesis by admiring the "*Unavoidable Truth - Development and (Biodiversity) Conservation are compatible but interdependent*".

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To Our Readers

Knowledgeable and perceptive as they are, our contributors must not necessarily be allowed to have the last word. It is for you, the readers, to join issues with them. Our columns are as much open to you as to our contributors. Your communications should, however, be brief and to the point.

Significance of In-service Teacher Education Induction Programmes in Schools for Improving Teaching Quality: A Comparative Study of Different Countries—Part-I#

Sunil Behari Mohanty*

Many developed nations do not consider pre-service teacher training as adequate for a new teacher. Referring to early-career teachers' level of preparedness, professional development, working conditions, and feelings of distress, Guerriero and Deligiannidi (2017, p.21) stated that "Importantly, the quality of the preparation of teachers and induction into the profession is poor as a consequence of the absence of a common body of scientific knowledge underpinning professional expertise and transmitted via teacher educators during initial teacher education." Admiraal, Røberg, Wiers-Jenssen, and Saab (2023, p. 1759) stated, "*In the first years of a teaching career, teachers experience high levels of distress, and the attrition rate appears to be high. Early-career teachers do not always feel well prepared for their job and feel insufficient support during their first experiences as teachers. Induction programs, professional development, and school support could equip early-career teachers with the additional teaching repertoire they need and improve their well-being. The current study aimed to contribute insights into the importance of the level of preparedness, professional development, and working conditions for early-career teachers' well-being.*"

Hence, the new teacher may need to go through an induction programme and must complete it before being allowed full teacher status. According to Feiman-Nemser, Schwille, Cindy, and Yusko (1999, p. 9), induction "is a humane response to the trials and tribulations associated with the first year of teaching." Wong (2002, p. 52) stated, "*You don't wait until after school begins and new teachers are in trouble to start a professional development program. Instead, you create a culture of professional growth and lifelong learning before beginning teachers ever see their first class. The best way to support, develop, and cultivate an attitude of*

lifelong learning in beginning teachers is through a new teacher induction program focused on teacher training, support, and retention."

"*Schools worldwide use induction programs to support beginning teachers in their first years of teaching. With induction programs, schools aim to contribute to beginning teachers' sense of well-being and professional development.*"*(Kessels 2010, p.9).* Bickmore and Bickmore (2010, p. 1006) defined induction as "a systematic process embedded in a healthy school climate that meets new teachers' personal and professional needs." Northwest Territories Teacher Induction (2011, p.5) defined induction as "*The process of providing a support system for the new and beginning teacher. This support system usually includes an orientation to the community, a formal mentoring program, and professional development to develop advanced and responsive teaching skills.*"

The induction process had its roots in the United States as far as 1943 (Kearney 2014, p.1). Hobson, Ashby, Malderez, and Tomilson (2009, p. 207) stated that "Since the 1980s, school-based mentoring has come to play an increasingly prominent role in supporting the initial preparation, induction and early professional development of teachers in many parts of the world." In the United States, Luchenko, Chervinko, and Doronina (2024, p. 131) reported: "*Numerous novice teacher induction programs, created primarily by state agencies, were the result of the educational reforms of the 1980s. Reformers argued that attention given to new teachers would help the novices to acquire the skills of experienced teachers and assimilate into the school culture more quickly.*"

O'Brien (2009, p. 48) stated that "Induction programmes work best when an effective training and professional development component is provided to support all role groups – new teachers, their mentors and principals." Ingersoll (2012, p.51) stated: "*Induction is an education reform whose time has come. Over the past two decades, there has been a*

large increase in the number of states, districts, and schools offering support, guidance, and orientation programs. Importantly, the data also indicate that induction can help retain teachers and improve their instruction. The data also show that the kinds and amounts of support vary. And some research suggests that content, intensity, and duration are important: The effect depends on how much induction one gets and for how long."

"Induction is generally seen as a supporting program for new entrants to the teaching profession." (Madalinska-Michalak 2019, p. 816). Teachers joining a school need to undergo an induction programme relevant to that school's purpose. Chatlain and Noonan (2005) pointed out that teachers trained mostly for secular schools needed an induction programme for working in Catholic schools. Cherubini (2007, p. 6) stated that beginning teachers reported that their confidence emanated from what one individual called "reflections on teaching and dealing with the big picture of schooling outside the classroom walls." Cherian and Daniel (2008) pointed out that principals suggested engagement of the entire school community for effective new teacher induction. Effective school-based induction for new teachers involves much more than mentoring; it requires a comprehensive array of supports buttressed by a collaborative professional culture"(Birkeland & Feiman-Nemser, 2009, p. 240). Induction is provided for three categories of new teachers: (a) new teachers having acquired essential qualifications and having appropriate permission/ license to teach; (b) new teachers having acquired essential qualifications, but without appropriate permission/license to teach; and (c) new teachers without essential qualifications, and also without appropriate permission/license to teach. Eaton and Sisson (2008, p. 1) stated, *"Induction programs, which often include a mentoring component, are designed to ease the beginning teacher's transition, while also providing professional development opportunities to build knowledge and enhance skills. Further, a growing body of evidence suggests that beginning-teacher induction programs can positively affect teacher quality, students' academic outcomes, and school costs."*

Fransson (2008, p.40) stated that "It can be difficult to conceptualise the concept of induction in a comparative perspective, because of the variations between countries and variations in the relationship between initial teacher education, induction and in-

service education." Ingersoll and Strong (2011, p. 1), in their review of research on the impact of induction and mentoring programmes, stated, *" For classroom instructional practices, the majority of studies reviewed showed that beginning teachers who participated in some kind of induction performed better at various aspects of teaching, such as keeping students on task, developing workable lesson plans, using effective student questioning practices, adjusting classroom activities to meet students' interests, maintaining a positive classroom atmosphere, and demonstrating successful classroom management. For student achievement, almost all of the studies showed that students of beginning teachers who participated in some kind of induction had higher scores, or gains, on academic achievement tests."*

Schleicher (2016, p.49) stated, *"The importance of induction programmes for new teachers in the early years of their teaching careers is now widely acknowledged. In successful programmes, mentor teachers provide guidance and supervision to beginning teachers in close collaboration with the initial teacher-education institution. These mentors provide on-the-job support, identify deficits in subject-matter knowledge, classroom management strategies, and other pedagogical processes. Central to the success of induction and mentoring programmes are the resources dedicated to those programmes and the quality of mentor training. Often, schools that would need to provide the most support to beginning teachers are the least capable of delivering high-quality induction programmes. Thus, effective partnerships between teacher-education institutions and schools are particularly important."*

Criteria for quality induction identified by Long et. al. (2012, p. 10) were: (a) Educated mentors, (b) Reflective inquiry and teaching processes, (c) Systemic and structured observations, (d) Formative teacher assessment, (e) Administrators' involvement, and (f) School culture supports. Kearney (2014, p. 4) stated that "Conclusions from the literature about educational induction suggest that there is not a common understanding as to what induction is, and it is difficult to articulate a conceptualisation that will satisfy the vast array of formal and informal practices currently undertaken in various educational settings." Olsen, Bjerkholt, and Heikkinen (2020, p. 15) stated, "Comprehensive induction includes not only activities and special induction programs for NQTs, but also a wider range

of measures to promote the professional learning of new teachers and the NQTs to be included in the profession. It requires attention to teaching as well as the whole responsibility of being a teacher." "Teacher induction has been an object of interest in teacher education and professional development, mostly as a result of the analysis of the difficulties faced and the coping strategies developed by newly qualified teachers," (García-Carrión, et al, 2020, p.1). Benoliel, Liu, and Liao (2025, p. 2) stated that "Teachers' participation in induction programs should be understood as both an institutional endeavor and an individualized experience." Kwok and Macfarlane (2025, p. 8) stated that *"Effective induction and teacher support systems depend heavily on policy frameworks that establish clear guidelines and ensure equitable access to resources. Ignoring the importance of supportive policies can lead to inadequate structures and resources."* OECD (2019a, p. 5) stated, *"Education systems and schools can create mechanisms to motivate teachers and support them in their initial years, such as through induction and mentoring. Although induction activities are designed not only for novice teachers but also for teachers new to the school, they can be a critical mechanism for novice teachers as they ease their transition from the theoretical aspect of their initial training to the practice of their everyday work."*

The starting year of such an induction programme in case of certain nations is: The Netherlands, 1997; Ireland, 2002; Scotland, 2002; Norway, 2003; Estonia, 2004; Cyprus, 2008. Ashby et al. (2008, p.52) stated, *Experiences of the induction year are dependent on many factors, including the induction arrangements made by schools, individual induction mentor-NQT (Newly Qualified Teacher) relationships, and how NQTs draw on their ITE to interpret their experiences as beginning teachers."*

ETUCE (2008) argued for an induction phase of at least one year's duration, which must include:

- support from mentors and other colleagues
- a reduced teaching timetable without a decrease in remuneration
- access to appropriate support resources
- attending a mandatory guidance programme
- opportunities to relate theory to practice systematically.

According to the European Commission (2010, p. 6), three stages in the professional development of teachers are: "The first stage concerns the preparation of teachers during initial teacher education, where those who want to become teachers master the basic knowledge and skills. The second stage is the first independent steps as teachers, the first years of confrontation with the reality of being a teacher in school. This phase is generally called the induction phase. The third phase is the phase of the continuing professional development of those teachers who have overcome the initial challenges of becoming a teacher."

According to the European Commission (2010, p.7), "Induction policies serve a range of policy objectives, including: dealing with skills deficits amongst the teaching workforce, improving school and teacher performance, encouraging more people to enter the teaching profession to replace the large numbers of expected retirements, and improving the effectiveness of initial Teacher Education programmes."

Schollaert (2011, p. 11) stated that "In fact, induction is a stage in a continuum that starts with initial teacher education and extends into continuing professional development, lifelong learning for teachers if you like. Consequently, the features that contribute to high-quality continuing professional development (CPD) are already hugely relevant at the induction stage."

Kang and Berliner (2012, p. 268) reported that "three induction activities are beneficial in significantly reducing turnover rates for beginning teachers: seminars, common planning time, and extra classroom assistance." Frederiksen (2020, p. 49) stated, "Induction training can counteract burnout, strengthen teacher resilience and thereby facilitate continuing professional development and a firm foothold in the job as a teacher." AITSL (2021, p. 28) stated, "Effective induction can facilitate a culture of professional support and expectations and translate the pedagogical and the theoretical into practice. Both induction and mentoring must be established well in school practices, follow the needs of the teacher, be supported and valued by the school, and be available to all early career teachers, particularly targeted to new teachers placed in hard-to-staff schools." Gaikhorst and Volman (2023, p.1103) stated, "Because of the complexity of urban teaching, teacher education cannot fully prepare teachers for urban teaching,

and schools themselves also have a role in this, for instance by offering adequate induction.”

Online Induction

Taranto (2011, p. 14) stated that “The new-teacher induction online learning community framework enhanced and expanded the experience of both the new teachers and contributors.” Koehler and Kim (2012, p. 221) stated: “Online learning tools offer the potential for better serving beginning teachers in their first experiences, where current support practices have been unfavorable. Using lessons learned from traditional mentoring and induction programs and combining the capabilities with online learning technology, future beginning teacher induction programs can provide beginning educators support in ways that are more aligned with their needs, schedule, and convenience.”

Mentoring

Mentoring is an essential component of the induction programme. Feiman-Nemser (1996, pp. 1-2) stated that: “Mentoring is a critical topic in education today and a favored strategy in U.S. policy initiatives focused on teacher induction. Besides creating new career opportunities for veteran teachers, assigning mentors to work with beginning teachers represents an improvement over the abrupt and unassisted entry into teaching that characterizes the experience of many novices.”

Huling and Resta (2001) stated that “Teacher mentoring programs have dramatically increased since the early 1980s as a vehicle to support and retain novice teachers.” According to Kaufmann (2007, p.1), “Mentors serve as advisers and guides for new and beginning teachers. Mentors have more experience in the profession and the system and provide wisdom, trust, and one-on-one support as counselors and teachers to the novice teacher. Mentoring refers to the process of support given by a mentor or veteran teacher to an inexperienced teacher. Synonyms for mentor include: buddy, coach, master teacher, veteran teacher, experienced teacher, counselor, observer, trainer, role model, adviser, guide, senior sponsor, and supporter.”

Moir and Gless (2001, p.114) stated that: “Mentoring a new teacher helps the veteran learn and grow as never before. The veteran teacher has a chance to step out of their classroom and observe in many different teaching situations. This broadens their perspective of effective teaching, allows them to put into words the expertise they have developed over their career, and gives them a chance to reflect on their own practice.”

Norman and Feiman-Nemser(2005, p. 679) stated, “One particularly important role mentor teachers can play is to help beginning teachers to focus on students’ ‘mind activity’ in order to build on their prior knowledge, experience, and interests, and to promote understanding and meaningful learning.” In reporting findings of a study on mentoring for induction in the US, Athanases et al. (2008) suggested that tools, scripts, and routines could facilitate mentoring; however, there was a need for adapting generic scaffolds and tailoring them to local needs. Northwest Territories Teacher Induction (2011, p.5) defined mentorship as “a dynamic process, which builds on the needs of the beginning teacher, the strengths of the mentor and the relationship between the two.” Bradbury (2010, p. 1053) stated, “Educative mentoring is based on ambitious goals for the potential influence that mentor-teachers can have. Attaining these goals is dependent upon educative mentors exhibiting specific behaviors that promote novices’ learning.” Frels, Zientek, and Onwuegbuzie (2013, p.53) reported that “Implications for teacher mentoring programs might include that due to the time restraints and other practical limitations of mentoring, an integrated tradition of mentoring might be infused into teacher identity wherein teachers who serve as mentors also were personally mentored in some way.” Heikkinen (2020, p.27) suggested ten ecological principles in mentoring: 1. Networks, 2. Nested Systems, 3. Niches, 4. Interdependence, 5. Diversity, 6. Cycles, 7. Flows, 8. Development, 9. Dynamic Balance, and 10. Resilience. OECD (2025, p. 197) stated that “Particularly demanding practices may serve as particularly fruitful areas of focus for mentoring efforts between more accomplished teachers and those that are new to the profession.”

Jokinen, Morberg, Poom-Valickis, and Rohtma (2008, p.121) in their review of mentoring of newly qualified teachers in Estonia, Finland, and Sweden stated that: “There were also differences between the mentoring practices as to how and to what extent mentoring involves boundary-crossing. For example, should the mentor and the mentee come from the same school or from different schools? Do mentors and mentees visit each other’s classes or schools? Should participants represent the same school

subjects? Can class teachers, subject teachers, and vocational teachers participate in the same groups? There seems to be no unambiguous answers to these questions."

OECD (2019b, pp.12-13) stated, "Mentoring programmes can be drivers of quality induction if they build on good practices. However, evidence on effective mentoring and how to build the capacity of experienced teachers to become mentors is not yet robust enough. When induction and support programmes are integrated in a professional learning culture, schools are able to engage new teachers in innovation and continuous school improvement."

Induction Programmes in Different Countries

There is variation in induction programmes in different countries. There have also been developments in strategies over time.

Australia

In 2014, the Teacher Education Ministerial Advisory Group, Government of Australia, stated that: "In the area of supporting beginning teachers through induction, the Advisory Group recommends that:

1. The Australian Institute for Teaching and School Leadership develops national guidelines for beginning teacher induction that will guide consistent implementation of effective induction programs.

2. School systems and employers provide effective induction for all beginning teachers, including those employed on a short-term or casual basis.

3. Schools identify highly skilled teachers to mentor, assess, and guide beginning teachers from provisional registration to full registration.

4. Beginning teachers build on their Portfolio of Evidence to reach full registration at the proficient level of the Professional Standards. (TEMAG 2014, p. 39),

The Australian Government (2022,p.19) stated that: "The Australian Institute for Teaching and School Leadership (AITSL) will develop the guidelines, with jurisdictions, sectors, and unions to consider the time it would take to support implementation. The guidelines will have regard to the needs of specific groups, including inclusive practice for supporting students with diverse learning needs, First Nations teachers, and teachers in regional and remote areas.

The Australian Government will work with the states and territories to explore opportunities to strengthen mentoring and other support, including in-class support, for early career teachers."

AITSL (2023, p. 8), stated that: "Induction is most effective when undertaken over an extended period (approximately two years or more for full-time equivalent teachers) in settings with a strong learning culture and professional relationships. The use of high-quality mentors, colleagues, and communities of practice should be included in the induction program. Effective induction programs allow early career teachers to share their ideas, develop goals, and collaborate with peers to improve their practice. When this reciprocal learning occurs, it strengthens the early career teachers' connection to the profession and workplace by acknowledging their value as teachers."

Austria

Zuljan and Požarnik (2014, p.195) stated that, "In Austria, there is a one-year induction phase, but only for teachers of general academic subjects at gymnasium and in vocational education. It is interesting to note that no induction is foreseen for teachers in compulsory education, as the school practice they get during initial education is perceived as sufficient. The induction phase is regarded as the responsibility of local school authorities in cooperation with Faculties of Education (*Pädagogische Hochschulen*). Local school authorities present to schools a list of mentors who are trained and authorised to supervise novice teachers."

According to OECD (2024a, *p.93)*," Austria introduced a mandatory one-year induction period for new VET teachers in 2019. This includes practical professional development in 'practice schools' under the supervision of experienced professional mentors."

Belgium

Minea-Pic, Nusche, Sinnema, and Stoll (2021, p.9) stated, " As of September 2019, teacher induction became a right for novice teachers and an obligation for schools to provide. New opportunities were introduced for diversifying the profile and skills of the teacher workforce, reinforcing links with the labour market and addressing teacher shortages."

Canada

Hellsten, Prytula, Ebanks and Lai (2009, p.703) suggested three themes of teacher induction-

(a) assigned/unassigned mentors, (b) engaged/disengaged mentors, (c) single/multiple mentors and a moderating theme compatibility of the mentor and beginning teacher, which could provide an alternative model of mentoring based on learning communities and founded on the concepts of strong and weak ties and the constructivist model of knowledge. Abu Rass (2012), in a study on induction programme in the Northwest territories in Canada, pointed out the need to develop cultural competence of new teachers so that they could promote multiculturalism. Ontario College of Teachers (2019, pp. 56-57) stated that, "The New Teacher Induction Program (NTIP) provides professional learning support for many teachers in permanent and long-term occasional positions in Ontario district school boards during their first two years of teaching. The NTIP assists with professional growth and development for entry into a challenging profession.

"New Teacher - a teacher certified by the Ontario College of Teachers hired into a permanent position, full-time or part-time, by a publicly funded school board to begin teaching for the first time in Ontario. A teacher is considered "new" until she/he completes the NTIP or when 24 months have elapsed since the date on which he/she first began to teach for a board."

NCEE, US (2023a) stated that: "Once Ontario teachers graduate from teacher education, the province provides a year-long induction program, with an option to extend to a second year. The New Teacher Induction Program gives all new teachers a reduced teaching load and assigns them an experienced teacher mentor, who also has a reduced teaching load. The new teachers also take part in professional development designed to orient and support them throughout the year. New teachers and their mentors are evaluated at the end of the year."

Kutsyuruba, Godden, and Walker. (2024) analysing the development and implementation of New Teacher Induction Program (NTIP) in Ontario province of Canada reported that "challenges faced within the school board included scheduling times for mentors and new teachers to meet, how to give meaningful feedback, and finding ways to support daily occasional teachers." OECD (2024a, p. 93) stated that: "In 2018, Ontario (Canada) extended its New Teacher Induction programme to include any teacher in the first five years of their practice. A key element of the programme is continuous mentoring by an experienced colleague. Longitudinal research shows that participating novice teachers have made meaningful and sustained improvements in confidence, efficacy, and instructional practice and show commitment to ongoing professional learning. Formal and informal mentorship or support from colleagues were seen as particularly helpful, with relationships between mentors and mentees and between the mentors themselves identified as key to successful implementation."

Chile

In 2016, Chile had a new law. Schleicher (2018a, p.101) stated that: "The new law raised the requirements for entry into initial teacher education (ITE), introduced quality assurance mechanisms into ITE programmes (compulsory accreditation and a diagnostic external exam one year before graduation), and established induction programmes for new teachers, specific preparation for mentors and free professional development opportunities."

Denmark

Frederiksen and Bonde (2020, p. 78) stated that: "The biggest challenge in Denmark just now is that there is no national organization or resources for the support of newly qualified teachers. The study quoted the 2019 Teacher Commission recommendation *viz,* 'schools introduce initiatives to mentoring and induction programs, including relevant induction courses."

Estonia

Eisenschmidt, Poom-Valickis, and Kärner (2011, p. 70) mentioned a historical development of the induction programme in Estonia. "A preliminary project was carried out in the academic year 2002-2003. In 2003-2004, an expert group consisting of professors from Tallinn and Tartu Universities analysed the results of the preliminary project, improved the implementation model, and made preparations for the implementation of the induction-year programme at the national level. Considering that the educational institution, where a beginning teacher starts his or her career, has a significant role to play in successful implementation of the induction year, it was important to involve practicing teachers and school managers in the preparation of the objectives, content, and principles of the induction year programme and introduce the idea of the induction year implementation and related issues to the wider educational public."

In an analysis of an induction programme in Estonia, Stingu (2013, p. 157) pointed out a number of difficulties related to mentors, newly qualified teachers, school culture, and university approach, which could be tackled by accurately defining liabilities and ways in which these can be fulfilled. NCEE, US (2023b) stated that "Once they begin working in schools, new teachers receive a full year of induction support from another trained mentor teacher, who is generally selected based on experience and ability to guide new teachers' professional growth." Eisenschmidt and Poom-Valickis (2020, p. 104) stated, "In conclusion, the search for a sustainable model of induction for new teachers will continue as long as the contexts and all actors in the system are in development.

Finland

Schleicher (2018a, p.101) stated, "Finland does not have a nationally organised induction system. Education providers and individual schools have autonomy over arranging support for new teachers, which leads to notable differences between schools in how they implement induction. "The nation has a system of Peer-Group Mentoring model (PGM). Heikkinen, Pennanen, Markkanen, and Tynjala (2020, p. 111) stated that: "The peer-mentoring group usually meets six to eight times during the academic year, with each meeting lasting around one and a half to two hours. In the first meeting, the group draws up an action plan. The group can decide to devote each PGM session to a specific theme, or choose a common theme for the entire academic year, such as multiculturalism, curriculum work, or teaching method development in a specific discipline, such as the arts, physical education, mathematics, etc. The mentor serves as the facilitator of the group and is responsible for maintaining the group schedule. The mentor also leads the discussion, striving to allot speaking time equally among participants."

France

Zuljan and Požarnik (2014, p.197) stated that: "In France, the framework for curricula in initial teacher education and for the induction period is decided centrally at the national level. The induction period was introduced in 2005 and reformed in 2010 and 2013. The novice teacher gets special support during the first two years. The first year after passing the recruitment examination is a probationary period with the support of a mentor and the feedback (advice) of a school inspector through the observation of a class."

Germany

Zuljan and Požarnik (2014, p.195) stated that: "An example of a well-organised induction phase is Germany, where, after the initial education at the teacher's college or university, there is a 2-year phase called *Referendariat* during which the novice teacher, teaching part-time, obtains support in the form of training seminars organised by *Studienseminar* and by the mentor in order to develop professional competencies and overcome initial insecurity. The novice is constantly evaluated and counselled by mentors and peers."

Hong Kong (China)

Cheng and Cheung (2004, p. 188) suggested improvement in a number of teacher competence items, including those of classroom management and assessing students' learning. Advisory Committee on Teacher Education and Qualifications (2009) *proposed a year-long* induction programme for beginning teachers, aiming at: Providing comprehensive workplace experience; Providing integrated professional guidance and support; Laying a firm foundation for lifelong learning; and facilitating systematic reflection and self-evaluation. NCEE, US (2023c) stated that "Once teachers are hired by schools, they are provided with one year of support from experienced teachers trained as mentors by the EDB. This is done through the Teacher Induction Scheme, started in 2008."

Iceland

In 2013, the Department of Education at the University of Akureyri offered an education program (30 ECTS credits) with a focus on mentoring. According to Svanbjornsdottir, Hauksdottir, and Steingrimsdottir (2020, p.129), "teachers involved found themselves to be more competent after completing the mentoring program, with a deeper understanding of the theories behind mentoring, which was reflected in their increased engagement in school improvement."

Ireland

Morgan and Burke (2011, p. 133) stated that: "The main objective of induction in the Irish context is towards supporting the personal, professional, and pedagogical development of beginning teachers by way of systematic support in the first

year of teaching. The programme comprises five main elements: school-based mentoring; off-site professional development via the Education Centre network; professional development support groups; individualised support at school level from the Induction Programme support team, and phone and email support, as well as a dedicated website."

Israel

Sonmark et al. (2017, p. 48) stated that in Israel, teachers have their license (Rishyon Hora'ah) – a requirement in addition to the degree and certificate – after successful completion of an induction period

Italy

Mangione et al (2016, p. 154), referring to a new induction model introduced in Italy, stated that: "Indeed, unhinges a more instructivist approach, going deeper in results that derive from the educational research, which valorises the alternation between immersion and distancing in/from teaching practice, peer-assisted learning relationship, importance of self-assessment of professional skill."

Jamaica

Baker-Gardner (2014, pp. 292-293) reported that the induction programme had a low degree of effectiveness due to factors such as insufficient consideration of the uniqueness and nuances of the local context at the planning stage and inadequate support structures for classroom observation.

Japan

"The basic principles of the present system of teacher induction, including the goals and methods, were proposed in 1986 in the Second Report of the Prime Minister's *Ad Hoc* Council on Education" (Nohara 1997, p. 114). NCEE, US (2023d) stated that: "Once teachers have been hired, they undergo a one-year induction period. During this period, they are supervised by an experienced teacher who acts as a mentor. Both the new teacher and the mentor are given reduced teaching responsibilities to allow them to work together on classroom management, subject guidance, planning, and analyzing classroom teaching. Mentor selection varies across prefectures and even individual schools. Mentors are not given special training or additional compensation. New teachers are hired on a probationary basis. At the end of the first year, a teacher may be hired as a fully employed regular teacher and have access to all teacher benefits, including membership in the teachers' union."

Luchenko, Chervinko, and Doronina (2024, pp. 48-49) reported that: "As can be observed, teacher induction has a formal and compulsory status in Japan and occurs during a probationary period, with mentoring support as its key element. The practice concludes with an evaluation of novice teachers. The teaching practice is well-balanced with other components, such as mandatory out-of-school practice (courses, seminars, peer interaction). We can say that the improvement of practical teaching skills is well-regulated in Japan's programme; it is implemented with obligatory lesson observations, demonstration lessons, lesson study, and a research project, which is usually based on novice teachers' own practice during the induction year and can serve as a self-analysis."

Korea

NCEE, US (2023e) stated that: "Once teachers are hired, they go through three stages of school-based induction: pre-employment training, post-employment training, and follow-up training. The Ministry introduced a plan in 2016 to reduce new teachers' teaching hours to provide more time for this induction support. Pre-employment training typically lasts for two weeks and focuses on the practical elements of job preparation, like classroom management. This is followed by six months of on-the-job post-employment training, which is typically provided by principals, vice principals, and teacher mentors and involves instructional guidance and evaluation, classroom supervision, and instruction on clerical work and student guidance. Finally, during two weeks of follow-up training, new teachers share what they have learned through presentations, reports, or discussions with peers. Teachers can be upgraded to a Grade I certificate after three years of experience and 180 hours of required in-service qualification training. A Grade I certificate allows teachers to apply for leadership positions, such as principal or Master Teacher."

Luxembourg

Bertemes and Thill (2011, p. 201) in their report about beginning teachers in Luxembourg stated that after obtaining a Bachelor's certificate, the student may attend a competitive examination *('concour de recrutement')* Organised by the Ministry of National Education, which consists of (a) a written open-book

exam on the Luxembourg culture, written in one of the three official languages chosen by the candidate (b) a written test on teaching and learning where the candidates can choose between two proposed topics, generally one on pre-primary and the other one on primary education; and © a progression plan of learning activities on a given concrete everyday teaching situation.

Macau

Vong and Wong (2009, p. 34) stated that "to ensure quality and ongoing professional development, a formal teacher induction system or programme in the form of a university and school partnership is desirable."

Netherlands

OECD (2016, pp. 12-13) stated that "There should be a mandatory national induction programme for school leaders that guarantees the quality of induction and mentoring support, annual appraisals for all school leaders and personal development plans that are aligned to school goals."

New Zealand

Moskowitz and Kennedy (1997, pp. 140-141) stated: "The primary component of the teacher induction program is the Advice and Guidance Program (AGP). Other components include the courses or programs delivered by advisors from teacher support services and school-level school and individual in-services. With the exception of those run by teacher support services, the programmes are designed and implemented by each school within a framework developed and established at the member level."

Cameron (2007, p. 74) stated that "many teachers, particularly in primary schools, appear to be well supported in their schools, although school culture is the major factor in the quality of support that they receive." In a review of the induction and mentoring in New Zealand, Whatman (2016, p. 19) found, "mentoring practice remained varied, provisionally certificated teacher experiences were very dependent on local contexts, and newly published national resources were often poorly understood and underutilised. In part, this disparity between intended and actual practice can be explained by New Zealand's self-managing school / early childhood education system, which gives individual sites a high degree of autonomy. Lack of sustained professional learning opportunities for mentors, and lack of clarity of requirements for provisionally certificated teacher registration/certification compounded the situation. We saw and read of examples of very effective induction and mentoring; we also saw and heard stories where mentors and provisionally certificated teachers had been "left alone to sink".

Norway

Toril, Lund, and Simonsen (2016, p. 47) stated: "There is no link between induction-related activities and certification of teachers in Norway. Induction-related activities are increasingly linked to professional development, and there is a growing number of applicants for such courses (cf. career paths above). In many schools, mentoring of newly qualified teachers continues in the form of colleague-based coaching and in some instances leads to school development, action research, and lesson studies."

Poland

NCEE, US (2023f) stated that "There is a required nine-month induction period for new teachers. They are assigned a mentor and must be interviewed by a qualifications board at the end of the induction period to be promoted to full-qualified teachers."

Russia

In Russia, according to Valeeva, Kalimullin, Baklashova, and Latypova (2021, p.1), "The dominant role in its implementation is played by the school itself, and by its teaching and managerial staff."

Singapore

Jensen et al (2016, p. 14) stated that:

"School staff developers (SSDs) are professional learning leaders in Singapore schools. Senior teachers are appointed to the role, where they champion, plan, and help deliver professional learning within a school. They design and deliver professional learning initiatives, and lead induction and mentoring programs for new and novice teachers."

NCEE, US (2023g) stated that "After graduation from either the undergraduate or graduate programs, all beginning teachers take part in a two-year induction program led by the AST and funded by the Ministry of Education. During this period, teachers have a reduced teaching load in order to attend classes and work with a trained mentor."

Slovenia

Zorman (2011, p. 153) stated: "As part of the legislative framework for the 1996 school reform, the requirements for the teaching profession were also defined, including the induction of newly qualified teachers. The first year in the profession was recognised as crucial for the whole career. Consequently, mentoring by an experienced teacher and limited responsibilities for newcomers during their first year were decided."

Sweden

Fransson (2020, pp. 177-178) mentioned that: "The current situation in Sweden is that some legislation and regulations related to the mentoring of the NQTs are in place, although recent data says that induction and mentoring are not as widespread as might be expected. Major stakeholders such as the two teacher unions, Swedish National Agency for Education, and the Swedish Educational Broadcasting Company (UR) are identified as providers of web-based materials supporting NQTs."

Taiwan

NCEE*, US (2023h) stated that: "The Ministry of Education does not require that schools provide new teacher induction programs, but the government does mandate that teacher preparation institutions provide technical assistance and professional development to their graduates to help them transition into their roles. The government also provides a financial subsidy to encourage experienced teachers to mentor new teachers, but these arrangements vary by school and district."

Turkey

Baran Kaya and Baki (2023, p. 63) stated that "When viewed in the context of evaluation criteria, it can be said that novice teachers in Türkiye are not evaluated based on their content-specific teaching practices, because mentors and novices are not matched well and there is no time allocated for observation and interviewing."

United Kingdom(UK)

In the UK, an individual possessing qualified teacher status can undertake induction. As per Jones, Bubb, Totterdell, and Heilbronn (2002, p. 507), "the statutory induction policy appears to have been written for those who have time and space, make it a priority of management, and have the knowledge and capability to implement it fully. This is so because, while it is largely internally coherent and can be argued to be externally coherent as a policy document, it is not necessarily externally coherent when put into school contexts. In other words, while it makes sense, it is not adequately referenced to the context of present-day schooling in England. Thus, it sometimes fails to fulfill expectations in reality. This is especially the case in relation to specific categories of NQTs: those looking to do induction whilst on supply, those working in very small schools or where there are high levels of teacher shortage, and those teaching in classes which present regular discipline challenges." Recommendations given by Totterdell et al. (2002, pp.145-147) included the following:

i. In partnership with Appropriate Bodies, headteachers should properly prepare induction tutors for their role. Headteachers need to encourage opportunities for induction tutors to meet others, particularly for the moderation of assessments. The information and expertise gained then needs to be disseminated to all members of staff in their school involved in induction.

ii. There should be dedicated, regular, funded time for induction tutors to carry out the responsibilities of their role.

iii. Schools should monitor the timetables of their NQTs to ensure that all NQTs are consistently receiving their entitlement to a 10% reduced teaching timetable throughout the school year. Schools should also ensure that this 10% reduction is not spent on non-inducible activities. Activities such as marking and planning, however, can be inductive activities when structured into the induction programme and accompanied by professional guidance and dialogue with the induction tutor.

Eurydice (2004, p. 14) stated that, "The national Standards set out what a trainee teacher must know, understand and be able to do in order to qualify and gain Qualified Teacher Status (QTS). The Standards are organised in three sections, namely Professional Values and Practice; Knowledge and Skills; and Teaching. Mandatory tests in literacy, numeracy, and ICT skills are also required, as is the successful completion of a year-long induction phase during which new teachers are expected to demonstrate that they continue to meet and build on the standards in each of the areas listed."

Bubb and Earley (2006, p. 11), referring to 'educational vandalism' of new teachers' professional development, stated that "Schools that create respectful, supportive learning communities in which new teachers receive equitable treatment will provide their pupils with a better education and a chance for a more fulfilling future." Draper, Christie, and O'Brien (2007, p. 392), reporting about the New Teacher Education Induction Scheme in Scotland, stated that, "Instead of teaching full time, new teachers were guaranteed a 70% teaching load, with 30% of the time designated for professional development. Support became an entitlement, with an experienced member of staff designated as a mentor or supporter and freed for 10% of the week. Starting pay for new teachers would be on a new point below the teacher scale. In the past, summative assessment determined whether probationers would be permitted to become fully registered with the General Teaching Council Scotland (GTCS) as members of the profession. With the new scheme, probationers have to produce a portfolio of evidence to show that they have met the newly introduced SFR, against a background of structured observation and development opportunities," *(SFR- Standards for Full Registration).*

Department for Children, Schools and Families, UK (2008, p. 4) stated: "Funding for the induction of Newly Qualified Teachers (NQTs) in maintained and non-maintained special schools is incorporated into the main school funding system. It is for schools to ensure they commit appropriate resources to induction. Independent schools or further education institutions choosing to offer induction to NQTs should also ensure that appropriate resources are deployed."

Hobson, Malderez, Tracey, Homer, Ashby, Mitchell, McIntyre, Cooper, Roper, Chambers, and Tomlinson (2009, pp. 72-73) stated: "Newly Qualified Teachers (NQTs) are required to complete a period of statutory Induction to teach in maintained schools (in England). The Induction period normally lasts one year (three terms or equivalent) for full-time teachers. Part-time teachers must complete an Induction period equal to the number of days in the academic year of the school in which they start Induction. NQTs must have a contract of employment for at least one term (where the academic year is three terms) for that period of employment to count towards their Induction period. They can undertake short-term supply work in maintained schools for up to 16 months without having completed an Induction period (and can also ask for this limit to be extended by up to 12 months). Induction can also be served in FE institutions or independent schools, although it is not a requirement to complete Induction to teach in these institutions. In order to complete their period of Induction, NQTs must demonstrate their capability against a set of Standards designed to be consistent with and build upon those developed for ITT.63 They must receive a monitoring and support programme facilitated by the head teacher and /or the Induction tutor which includes: a reduced timetable; support and guidance from an Induction tutor (or 'mentor'); observation of their teaching; and regular professional reviews of progress."

Hulme and Menter (2011, p. 79) stated that in the United Kingdom, "On leaving initial teacher education, beginning teachers working in state-maintained schools participate in a statutory induction programme. Induction Standards/competences, mentoring and assessment arrangements, and release time for probationer professional development vary cross-nationally. A partnership model of induction was introduced in Northern Ireland in 1998. Induction Standards were set in Scotland in 2002 and in England and Wales in 2003 (revised in 2007). Most teachers aim to achieve 'full registration' or fully qualified professional status within one year, although this is influenced by the availability of teaching posts. Training for school-based mentors and the role of university-based teacher educators in induction is a source of debate and is stimulating some interesting developments in school-university partnerships in Scotland."

Training and Development Agency for Schools, UK (2011) brought out a list of standards for the induction process under five sections: 1. Developing professional and constructive relationships; 2. Working within the law and frameworks; 3. Professional knowledge and understanding; 4. Professional skills, and 5. Developing practice. Department for Education, UK (2018) stated that, "Statutory induction is the bridge between initial teacher training and a career in teaching. It combines a personalised programme of development, support, and professional dialogue with monitoring and an assessment of performance against the relevant standards. The programme should support the newly qualified teacher (NQT) in demonstrating

that their performance against the relevant standards is satisfactory by the end of the period and equip them with the tools to be an effective and successful teacher."

Luchenko, Chervinko and Doronina (2024, pp. 112-113) reported that, "To the prerequisites for the introduction of teacher induction programmes belongs the following: in-service training, short periods of practice teaching, appropriate timing as well as frequency of teaching practicum, theory-based teacher training programmes (before or/ and concurrently), provision of opportunities to facilitate adjustment to a new social environment and other circumstances within a particular school, the need for developing a sense of mission in teaching, regulating and handling changing parents' requirements for schools and increasing pedagogical responsibility. Another important precondition for successful induction programmes is mentor training and the involvement of supplemental instructors and part-time lecturers, since mentoring teachers are overburdened with the sheer number of trainee teachers in addition to performing their primary professional duties as teachers."

In Scotland, the General Teaching Council of Scotland (GTCS) (2025) stated that "The Teacher Induction Scheme (TIS) is a Scottish Government scheme which provides a guaranteed one-year, full-time placement to every eligible provisionally registered teacher in a local authority after having graduated with a teaching qualification from one of Scotland's Higher Education Institutions."

Approaches for Induction

Department for Education (DfE) (2025, pp. 22-23) mentioned two approaches for providing induction for Early Career Teachers (ECT)(England): "There are now two approaches schools can choose from, to enable the delivery of a training programme based on the 'Initial Teacher Training and Early Career Framework' (ITTECF). It is up to the headteacher to choose the approach that best suits the needs of their ECTs and mentors. The approaches are:

i. *A funded provider-led programme* - Schools can choose to work with providers accredited by DfE who will design and deliver a programme of face-to-face and online training to ECTs and their mentors. This programme is funded by DfE. School-led materials, which include ready-to-use materials and resources for early career teachers and mentors, to deliver their own ECT and mentor support. These materials have been accredited by DfE and quality assured by the Education Endowment Foundation

ii. *Schools deliver their own training programme (with the option to use freely available school-led materials and resources)* - Schools can choose to develop their own programme of training and support based on the ITTECF. The content of the framework must be covered in full. Schools can choose to use, in full or in part, the freely available school-led materials, which include ready-to-use materials and resources for early career teachers and mentors, to deliver their own ECT and mentor support. These materials have been accredited by DfE and quality assured by the Education Endowment Foundation. Department for Education (2025, pp. 23-24) mentioned the following strategies for tutors and mentors in the case of Induction for Early Career Teachers (England).

Appointment of an Induction Tutor: The headteacher/principal should identify a person to act as the ECT's induction tutor, to provide regular monitoring and support, and coordination of assessment. The induction tutor is expected to hold Qualified Teacher Status (QTS) and have the necessary skills, knowledge, and experience to work successfully in this role and be able to assess the ECT's progress against the Teachers' Standards. This is a very important element of the induction process, and the induction tutor must be given sufficient time to carry out the role effectively and to meet the needs of the ECT. The induction tutor will need to be able to make rigorous and fair judgements about the ECT's progress in relation to the Teachers' Standards. They will need to be able to recognise when early action is needed in the case of an ECT who is experiencing difficulties. It may, in some circumstances, be appropriate for the headteacher/principal to be the induction tutor. The induction tutor is a separate role from that of a mentor.

To be contd....

❑

How Body Schema Enhances Inclusion in Mentally Retarded Children

Archana* and Amita Bajpai**

Inclusion of children with intellectual disabilities, particularly those classified as mentally retarded, in mainstream educational and social settings is a critical goal in contemporary education systems. In India, the prevalence of intellectual disabilities among children is significant, with estimates suggesting that approximately 1-3% of the child population is affected (Indian Council of Medical Research, 2009). This demographic group faces numerous challenges, including deficits in motor coordination, spatial awareness, and social interaction, which hinder their integration into regular educational environments.

Body schema, a term rooted in neuroscience and psychology, refers to the dynamic representation of the body's position, movement, and spatial orientation. Initially conceptualised by Head and Holmes (1911), body schema is essential for coordinating motor actions and interacting with the environment effectively. It encompasses proprioceptive feedback—sensory information from muscles and joints about the position and movement of the body parts—and integrates this information to form a cohesive sense of body awareness.

Children with intellectual disabilities often exhibit deficits in body schema, which can manifest as challenges in motor coordination, spatial awareness, and body awareness (Gallagher, 2005). These difficulties can hinder their ability to perform everyday tasks, participate in physical activities, and engage in social interactions. Consequently, enhancing body schema is not only crucial for improving motor skills but also for fostering social inclusion and participation.

Keeping this in view, the authors tried to investigate the role of body schema in promoting the inclusion of mentally retarded children in mainstream educational and social settings in India. Utilizing an exploratory qualitative methodology, the research synthesizes findings from a comprehensive literature review, expert interviews, and case studies. Results indicate that interventions such as sensory integration therapy, physical therapy, and occupational therapy significantly enhance motor skills, spatial awareness, social interactions, and self-esteem. Despite challenges like limited resources and variability in intervention effectiveness, the study underscores the transformative potential of body schema enhancement for inclusive education. Recommendations include increased funding, professional development, and collaborative approaches involving families.

According to data from the Ministry of Social Justice and Empowerment, Government of India (2018)**,** approximately 2.2% of the Indian population has some form of disability, with a considerable proportion being children with intellectual disabilities. The *Sarva Shiksha Abhiyan* (SSA) program, launched in 2001, aims to universalise elementary education by including children with disabilities. However, reports indicate that only around 10% of children with disabilities are enrolled in mainstream schools (UNESCO, 2019)**.** This low enrollment rate highlights the need for effective strategies to support the inclusion of mentally retarded children in mainstream education.

Inclusion in educational and social settings has emerged as a critical objective in the development of children with intellectual disabilities. This paradigm shift towards inclusive practices underscores the importance of providing equitable opportunities for all children, regardless of their cognitive abilities. Among the numerous factors that facilitate inclusion, the concept of body schema—an internal representation of the body's position and movement in space—plays a pivotal role. This introduction delves into the intricate relationship between body schema and inclusion, specifically focusing on children with intellectual disabilities, commonly referred to as mentally retarded children.

Inclusion is a multifaceted concept that involves integrating children with disabilities into mainstream educational and social environments. It is predicated on the belief that all children, regardless of their abilities, have the right to learn, play, and grow alongside their peers. Inclusion aims to promote equal opportunities,

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reduce stigma, and enhance the social, emotional, and academic development of children with disabilities (Salend, 2016). For mentally retarded children, inclusion can significantly impact their quality of life, self-esteem, and sense of belonging.

Body Schema and Inclusion: A Synergistic Relationship

The relationship between body schema and inclusion is inherently synergistic. An improved body schema can lead to better motor coordination, which in turn facilitates greater independence and participation in various activities. For mentally retarded children, this means being able to engage more fully in classroom activities, playground interactions, and other social settings. This enhanced participation can boost their self-confidence, reduce feelings of isolation, and foster positive peer relationships.

Several interventions have been identified as effective in improving body schema in children with intellectual disabilities. These include physical therapy, occupational therapy, and sensory integration therapy, among others. Ayres (2005) emphasised the role of sensory integration therapy in helping children process and respond to sensory information more effectively. This therapy involves activities that challenge the child's ability to integrate sensory input, thereby improving body awareness and coordination.

Physical therapy focuses on enhancing gross motor skills through exercises and activities that promote strength, balance, and coordination. It helps children develop a better sense of their body's position and movement in space, which is essential for performing everyday tasks and participating in physical activities. Studies have shown that physical therapy can significantly improve motor skills in children with intellectual disabilities, thereby enhancing their ability to participate in inclusive settings (Case-Smith, 2013).

Occupational therapy aims to develop fine motor skills and functional abilities that are necessary for daily living. Therapists use a variety of techniques to help children with intellectual disabilities improve their hand-eye coordination, dexterity, and overall body awareness. By enhancing these skills, occupational therapy contributes to a better body schema, which facilitates greater independence and participation in social and educational activities (Scherzer, *et al.*, 2012).

Sensory integration therapy, developed by Ayres (2005), is particularly effective for children who have difficulty processing sensory information. This therapy involves activities that provide vestibular, proprioceptive, and tactile stimulation to help children improve their sensory processing and body awareness. Enhanced sensory integration can lead to improved body schema, which is crucial for motor coordination and spatial awareness (Ayres, 2005).

Impact of Enhanced Body Schema on Inclusion

The enhancement of body schema through these interventions can have a profound impact on the inclusion of mentally retarded children. Improved motor skills and body awareness can lead to greater independence, allowing children to perform tasks without constant assistance. This independence is a critical factor in their ability to participate in inclusive settings, such as mainstream classrooms and community activities.

Review of Literature

Ayres (2005) conducted a seminal study on sensory integration therapy, which focuses on improving the processing of sensory information in children with developmental delays, including those with intellectual disabilities. The study highlighted the importance of sensory integration in enhancing body schema, thereby improving motor coordination and spatial awareness. Ayres' work forms the basis for many contemporary therapeutic practices aimed at enhancing body schema in children with intellectual disabilities.

Case-Smith (2013) reviewed various interventions designed to promote social and emotional development in young children with disabilities. The review found that interventions targeting motor skills and body schema were effective in improving social interactions and self-esteem. This study underscores the interconnectedness of physical and social development in children with intellectual disabilities.

Gallagher (2005) explored the concept of body schema and its impact on cognitive and motor functions. The study provided a theoretical framework for understanding how body schema deficits can affect children with intellectual disabilities, leading to challenges in motor coordination and social interaction. Gallagher's work emphasises the need for targeted interventions to improve body schema for better inclusion outcomes.

Head and Holmes (1911) conducted early research on the effects of cerebral lesions on sensory and motor functions. Their findings laid the groundwork for understanding body schema and its role in motor

coordination. This historical study is crucial for understanding the evolution of therapeutic approaches aimed at enhancing body schema in children with intellectual disabilities.

King, *et. al.* (2006) examined the role of parent-child relationships in the development of children with disabilities. The study highlighted that positive relationships and supportive environments are crucial for the effective implementation of body schema interventions. The findings suggest that family involvement is integral to the success of therapeutic programs aimed at enhancing body schema.

Kogan, *et. al.* (2009) conducted a survey to assess the health status of young children with special healthcare needs as reported by their parents. The study found that children with better-developed body schema showed improvements in overall health and participation in social activities. These findings reinforce the importance of body schema development for holistic well-being and inclusion.

Kramer, Bowyer, and Kielhofner (2009) presented the Model of Human Occupation, which emphasises the role of volition, habituation, and performance capacity in human behavior. Their work suggests that improving body schema can enhance performance capacity, thereby enabling children with intellectual disabilities to engage more effectively in daily activities and social interactions.

Palisano, *et. al.* (2001) explored participation-based therapy for children with physical disabilities, emphasising the importance of active involvement in therapeutic activities. The study found that therapies aimed at enhancing body schema were effective in promoting greater participation in school and community activities, highlighting the relevance of body schema for inclusion.

Salend (2016) provided a comprehensive guide on creating inclusive classrooms, focusing on strategies that support the inclusion of children with disabilities. The book emphasises the role of body schema in enabling children to participate fully in classroom activities and provides practical approaches for educators to support body schema development.

Scherzer, *et. al.* (2012) reviewed global practices in early diagnosis and intervention for children with developmental delays. The study highlighted the effectiveness of early interventions targeting body schema in improving long-term outcomes for children with intellectual disabilities. The findings support the implementation of early and targeted therapies to enhance body schema and promote inclusion.

Methodology

This study employs an exploratory qualitative research methodology to investigate how enhancing body schema can facilitate the inclusion of mentally retarded children into mainstream educational and social settings. The research design includes a comprehensive literature review, expert interviews, and case studies. The literature review synthesises existing knowledge on body schema, intellectual disabilities, and inclusion practices to establish a theoretical framework and identify research gaps. Semi-structured interviews with experts in special education, occupational therapy, physical therapy, and developmental psychology provide firsthand knowledge and professional insights into body schema development and effective interventions.

Results and Discussion

Inclusion of mentally retarded children in mainstream educational settings in India remains a significant challenge. Improving body schema, which is the internal representation of one's body position and movement in space, has been shown to facilitate this process. This section discusses the results of various studies and their implications in the context of Indian educational and therapeutic settings.

Several studies highlight the effectiveness of interventions aimed at enhancing body schema, leading to improvements in motor skills and spatial awareness among mentally retarded children. Sensory integration therapy, which involves activities that challenge children's ability to integrate sensory inputs, has been particularly effective. This therapy has been found to improve proprioceptive and vestibular processing, essential components of body schema (Ayres, 2005, and Fisher & Bundy, 1989).

In India, Neurodevelopmental Therapy (NDT) and vestibular stimulation have been implemented in various special schools with promising results. For instance, studies have shown that children who underwent vestibular stimulation exhibited significant improvements in postural control and motor coordination (Patel, 2005; Shumway-Cook & Woollacott, 1985). These improvements are crucial for performing everyday tasks and participating in physical activities, which are essential for inclusion in mainstream settings.

Enhanced body schema not only improves physical abilities but also has a positive impact on social skills and self-esteem. Improved motor coordination and spatial awareness enable children

to engage more confidently in social interactions, thereby fostering better peer relationships. In a study conducted in Kerala, regular primary school teachers reported that children with improved body schema showed increased participation in classroom activities and better social interactions (IOSR Journal, 2013).

These findings are supported by research indicating that sensory integration and occupational therapy can lead to significant improvements in self-esteem and social skills. Children who can move more confidently and accurately are more likely to participate in group activities, reducing feelings of isolation and promoting a sense of belonging (Miller, *et. al.*, 2007).

The inclusion of mentally retarded children in mainstream educational settings is a primary goal of initiatives like the Sarva Shiksha Abhiyan (SSA) in India. Studies have shown that schools implementing body schema interventions report higher levels of participation and integration of these children in regular classroom activities. Paramane (2011) observed that children who received targeted interventions to improve body schema were better able to engage in academic and extracurricular activities, contributing to a more inclusive school environment.

Case studies from various special education programs in India demonstrate that body schema interventions can significantly enhance the overall educational experience for mentally retarded children. These interventions include physical therapy, occupational therapy, and sensory integration therapy, all of which have been shown to improve motor skills, spatial awareness, and social interactions (Shumway-Cook, 1992 and Uyanik, Bumin, & Kayihan, 2003).

Conclusion

The development of body schema is a critical factor in the inclusion of mentally retarded children in educational and social settings in India. By enhancing body schema through targeted interventions such as physical therapy, occupational therapy, and sensory integration therapy, significant improvements can be made in motor skills, spatial awareness, social interactions, and self-esteem. These improvements facilitate greater participation in mainstream environments, contributing to more inclusive and equitable opportunities for all children.

Despite the challenges of limited resources and variability in intervention effectiveness, a concerted effort to promote body schema development can lead to substantial benefits. Increased funding, professional development for educators and caregivers, and

collaborative approaches involving families can enhance the effectiveness of these interventions. The positive outcomes observed in various case studies underscore the potential of body schema enhancement to transform the educational and social experiences of mentally retarded children in India.

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A Call to Action for Veterinary Graduates

Banwari Lal Purohit, Hon'ble Governor of Punjab and Administrator, Union Territory, Chandigarh delivered the Convocation Address at the 4th Convocation Ceremony at the Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana on March 06, 2024. He said, *"You have earned your degrees at a juncture when India is poised for an astonishing transformation, emerging as the fastest-growing economy globally. I call upon you to actively participate as catalysts in our nation's ascendancy and progression. Let us together create Viksit Bharat at 2047. Furthermore, I hope your foray into entrepreneurship not only promises personal growth but also enables you to provide employment opportunities to the less fortunate youth."* **Excerpts**

It is an immense pleasure for me to be here with you all and be a part of this ceremonious occasion of the 4th Convocation of Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana.

To begin with, I congratulate the emerging professional youth, receiving the Bachelor's, Master's and Doctorate Degrees today, after going through highly rigorous academic and research programmes.

I also congratulate all the Faculty members and other employees of the University who have directly or indirectly contributed to the success of the students graduating today.

It is a momentous occasion for the students as their meticulous hard work over the period of their studentship at the University culminates today with the award of degrees in today's convocation.

This is a day of fulfilment for the parents also, who invested their efforts in educating you to this level. They sacrificed their personal happiness and pleasure to make sure that you got the best education that leads to a better future. This day, therefore, belongs to them in equal measure.

My dear students, with the training and knowledge that you have gained here, you are entering a new and challenging phase of your life. Some of you may opt for higher studies, while some of you may take up a profession of your choice. The profession that you choose will offer you unlimited opportunities to showcase your talents and skills acquired during your stay at the University.

Today, the whole world is looking for the young, energetic and quality graduates from India.

Always remember to practice your profession faithfully with dignity and in keeping with the principles of veterinary medical ethics. Accept the continual improvement of professional knowledge and competence as a lifelong obligation. As the famous saying goes, I quote: "Success is no accident; it is hard work, perseverance, learning, studying, sacrifice and most of all, love of what you are doing." (Unquote).

My dear students, today's youth is tomorrow's nation. There is no power greater than youth, no force stronger than a young man's will, and you are a reservoir of energy, creativity and progressive ideas. For a developing nation like India, the youth are a treasure that is invaluable and priceless. They have the power to change the future for good and be part of the development of the nation.

You must be aware that Article 51A (g) of the Constitution of India places a duty on the citizens of India to protect and improve the natural environment, including forests, lakes, rivers and wildlife and to have compassion for living creatures. It is apt recall what Mahatma Gandhi once said, and I quote: "The greatness of a Nation and its moral progress can be judged by the way its animals are treated." (unquote).

Human–animal relationship dates back to the Harappan Civilisation, and we all know that sheep and goat were the first domesticated animals in the Indian subcontinent. Our country is predominantly an agricultural country, and Livestock keeping is a centuries-old, invaluable tradition of ancient India. Some of the most important cultural and religious institutions and traditions are linked to domesticated animals. Shalihotra, who was an expert in horse husbandry and medicine and who composed a text 'Asva Shastra', is regarded as the father of veterinary science.

Ancient literature is replete with texts composed by Sages on the treatment of ailments of horses and elephants. It is said that animal husbandry made great progress in the Mauryan age (322-232 BC), preceded by Buddha and Mahavir, who preached non-violence towards animals. It is described that the first veterinary hospital existed in Ashoka's regime.

In ancient India, people had great knowledge of animal healthcare. Ancient literature on veterinary science remains to be exploited, and a review of the historic knowledge of animal healthcare can open a window to the traditional system of veterinary medicine in India. Growing up as an emerging

economy, the livestock sector in India has contributed significantly towards the nation's GDP, contributing more than 5% to the national economy and providing employment to the 80 million dairy farmers directly. The livestock sector has made a huge contribution in augmenting the family incomes and generated gainful employment for landless labourers, small and marginal farmers. In addition, it has contributed to assuring food and nutritional security for the masses. Livestock are the best insurance against the vagaries of nature like drought, famine and other natural calamities.

Recognising the significance and potential of the livestock sector, the Government of India has launched various schemes for sustainable and responsible development of the livestock and fisheries sectors, including Rashtriya Gokul Mission, National Livestock Mission, Infrastructure Development Funds for dairy processing and Animal Husbandry, and the Pradhan Mantri Matsya Sampada Yojana.

Though our country has the largest livestock population, the per capita yield of livestock in India is not very encouraging and is comparatively towards the lower side. Thus, there is a dire need to take necessary steps to enhance the livestock milk productivity.

Moreover, in recent days, the livestock sector is facing a range of challenges, including climate change, emerging diseases, competition for natural resources and evolving demand for animal-source foods. The scientific breakthroughs and technology interventions play a key role in continuous and sustainable growth in the livestock sector.

I believe the university scientists can play a vital role in meeting these challenges through their knowledge, experience and research. I am happy that under the World Bank-funded NAHEP-Institution Development Plan, 42 faculty members and 188 students from the university underwent training programmes at esteemed foreign universities, honing their knowledge and strengthening valuable international collaborations. I am also pleased that the university has made many strides towards the development of skilled human resources/entrepreneurs for generating employment opportunities through an initiation of a new undergraduate degree programme i.e. Bachelor of Vocation (B.Voc.). This programe entails the concept of Integrated Farming and Entrepreneurship by synergising livestock and agricultural education.

Establishment of Dairy-Based Inclusive Technology Business Incubation (i-TBI) Centre at the University with fiscal support by the Department of Science and Technology, Government of India, is poised to emerge as a catalyst for transformative change, propelling Punjab to the forefront of the dairy industry's technological revolution.

It has come to my cognisance that the University and its outstations are sincerely focusing on curtailing the menace of stubble burning through scientific approaches and creating knowledge and awareness about its utilisation as animal feed. The university has been bestowed with high-priority responsibilities of hosting National Level Disease Diagnostic Centres by the Government of India, namely Lumpy Skin Disease (LSD) and African Swine Fever (ASF). Furthermore, the university is offering its services towards surveillance and monitoring of infectious diseases and endemic zoonotic diseases.

The role of extension services, especially in the transfer of technology, is most crucial for farmers to realise the gains from technological innovations. From the scientists' point of view, it is important to see that the technology reaches the end user in a rightful manner.

I am happy to know that the extension network of Guru Angad Dev University, including Krishi Vigyan Kendras (KVKs) are ensuring that the latest advancements and best practices in dairy processing reach even the farthest corners, empowering dairy farmers with the tools and techniques they need to optimise their operations and contribute to the overall advancement of the dairy industry in the region.

Veterinary Science is a noble profession that demands a selfless commitment to serving the needs of animals and the community, to improve the quality of our life by ensuring food security and safety, as well as preventing and controlling emerging diseases under the' One Health' concept, which takes a holistic approach to address human and animal health.

You have earned your Degrees at a juncture when India is poised for an astonishing transformation, emerging as the fastest-growing economy globally. I call upon you to actively participate as catalysts in our nation's ascendancy and progression. Let us together create *Viksit Bharat* at 2047. Furthermore, I hope your foray into entrepreneurship not only promises personal growth but also enables you to provide employment opportunities to the less fortunate youth.

I appreciate the University for commendable initiatives for the elevation of the livestock sector, and I extend my heartfelt wishes for the continued glory and success of the institution.

I once again congratulate you on this Convocation Day and wish you very well in your future career and life.

Thank you,
Jai Hind.

CAMPUS NEWS

National Seminar on *'Viksit Bharat@2047'*

The One-day National Seminar on '*Viksit Bharat*@2047' was organised by the Anjuman-I-Islam's Akbar Peerbhoy College of Education, Vashi, Navi Mumbai, recently. The event was sponsored by the Indian Council of Social Sciences Research, Western Regional Centre, Mumbai. During the Inaugural Session, the chief guest, Dr. Ashwini Karwande, Head, Department of Education, University of Mumbai, Dr. Netranand Pradhan, Professor, Head & Coordinator SAP, M.S. University of Baroda, Ms. Ainul Attar, Director Higher Education, Anjuman-I-Islam and Mr. Iqbal Kaware, College Development Committee Member, were present.

Dr. Supriya Deka, Associate Professor, AIAPCE, provided a comprehensive overview of the theme of *Viksit Bharat*, emphasising critical areas such as education, healthcare, women's empowerment, the digital economy, infrastructure, and sustainable development. She stated that the *Viksit Bharat* @2047 project is an ambitious initiative by the Government of India to commemorate 100 years of independence in 2047. She mentioned the various key themes of the project. She explained that the theme of Empowered Indians focuses on education, health, sports, women's empowerment, and creating a caring society and culture. She highlighted various initiatives, such as *Beti Bachao Beti Padhao*, *Sukanya Samriddhi Yojana*, and the Women Helpline Scheme, aimed at empowering women and promoting their equal participation in society. Regarding the theme of Thriving and Sustainable Economy, Dr. Deka emphasised the importance of modernising agriculture, promoting green industry, and developing infrastructure. She also stressed the need for a green economy, investing in renewable energy, and implementing sustainable practices. Dr. Deka discussed the significance of innovation, science, and technology in driving India's progress. She mentioned initiatives like Startup India, Digital India, and promoting STEM education to foster a culture of innovation. Finally, Dr. Deka touched upon the theme of India in the World, highlighting the importance of good governance, security, strategic partnerships, economic diplomacy, cultural diplomacy, and sustainable development in enhancing India's global presence and influence.

The Keynote Speaker, Dr. Netranand Pradhan, discussed the role of scientific advancements in achieving the vision of *Viksit Bharat*. He delivered a comprehensive presentation that offered a detailed overview of India's history, its current strengths, and the opportunities that lie ahead. He emphasised India's significant assets, including its large and dynamic youth population, a robust working demographic, abundant natural resources, and remarkable geographical diversity. Dr. Pradhan also highlighted the enduring importance of India's constitutional values as a cornerstone of its progress. Additionally, he provided an in-depth analysis of the challenges persisting in the country, offering valuable insights into the hurdles that need to be addressed to achieve sustainable growth. He painted a vision of India's potential position in 2050, outlining the strategic efforts and transformative measures required for the nation to attain the status of a developed country. His address underscored the pivotal role of leveraging India's strengths while addressing its challenges to secure a prosperous future. His reflections on *Viksit Bharat* @ 2047-India, once a developed country during ancient and medieval periods, lost its glory during the colonial period. However, after gaining independence, India has established itself as a democratic nation and has made significant economic progress. India has emerged as an economically powerful country, ranking fifth in the world with a $3.41 trillion economy. It has a significant share of 3.53% in the global GDP. India is also a major player in international trade, being the fourth largest consumer, tenth largest importer, and eighth largest exporter. Despite its economic progress, India faces several challenges. These include difficulty in ease of doing business, population growth, illiteracy, poverty, inequality, unemployment among youth, growing disturbances in neighbouring countries, concerns over quality education, environmental issues such as air and water pollution, deforestation, and depletion of non-renewable energies, poor sanitation, and unavailability of proper healthcare. However, there is hope for India to become a developed nation by 2047. India has a significant youth population, which will continue to drive economic growth. In conclusion, India's journey towards becoming a developed nation

by 2047 is challenging, but with its significant youth population, economic growth, and vision for the future, there is hope for a brighter tomorrow.

Dr. Ashwini Karwande offered insights into the vision of *Viksit Bharat* within the field of education, highlighting the initiatives being undertaken under the National Education Policy (NEP)- 2020 to drive transformative change. She shared the information about the Integrated Teacher Education Programme. Ms Ainul Attar shared her insights on the importance of skill development in driving economic growth and development. She also shared challenges from real-life personal experiences.

The paper presentation session was coordinated by Ms Sofiya Shaikh, Assistant Professor, AIAPC. The chairpersons for the paper presentation were Dr. Sunil Rajpurkar, Associate Professor, Smt. Kapila Khandelwal College of Education, Mumbai, Dr. Jyotishree C Hiremath, Assistant Professor, KSS Vijaynagar College of Education, Hubbali, Dr. Siddharth Ghatvisave, Associate Professor, PVDT College of Education for Women, SNDT Women's University, Mumbai, and Dr. Shumaila Saif Siddiqui, Principal, Aishabai College of Education, Mumbai. The paper presentation session was followed by the Panel Discussion, where queries of the participants were answered by the panellists. The concluding remarks of the panel discussion were given by Dr. Asma Shaikh, Principal, AIAPCE. The discussion was coordinated by Ms Nusrat Siddiqqi, Assistant Professor, AIAPCE.

The Valedictory Address was delivered by Dr. Narendra D Deshmukh, Senior Scientific Officer, Homi Bhabha Centre for Science Education, TIFR, Mumbai. Dr. Deshmukh delivered his speech, emphasising the importance of motivation, collaboration, and research in the pursuit of academic excellence. Dr. Deshmukh encouraged the audience to speak up, pose questions, think critically, and reflect on their experiences. He stressed the value of interaction and collaboration, highlighting the potential for small changes to spark meaningful opportunities. He emphasised the critical role of research in achieving sustainable development goals. He underscored the significance of research in driving academic growth. He advocated for the establishment of support systems for research within B.Ed. colleges and teacher training institutions. Furthermore, he suggested implementing programs to promote journal writing, recognising the importance of developing communication skills and academic writing. Dr. Deshmukh emphasised the need to focus on both the process and product of learning, cultivating essential 21st century skills. He encouraged educators to create a niche for academic writing, fostering a community that values critical thinking, creativity, and effective communication.

Mr Iqbal Kaware was encouraging the participant for reading, writing and communication skills. He also reflected the Ideas of *Viksit Bharat*@2024 with the current situation. The report of the event was presented by Dr Shirin Patel. Oral feedback was taken from four participants and written feedback was taken from all the participants. Finally, the certificates were distributed by Dr Babita Yadav, Librarian, AIAPCE, to the participants.

The seminar underscored the importance of research and creativity in addressing India's developmental challenges. The speakers emphasised the need for innovative solutions to drive economic growth and development, and highlighted the role of research in informing policy decisions.

International Conference on Climate Change and Sustainable Development

A three-day International Conference on 'Climate Change and Sustainable Development: Pioneering Paths in Environmental Sciences' is being organised to commemorate the Golden Jubilee Celebration of the School of Environmental Sciences, accompanied by *Anamnesis:* Alumni Meet by the Jawaharlal Nehru University, New Delhi, from October 05-07, 2025. It aims to highlight innovative approaches, policies, and practices in environmental science that can guide future climate action and sustainable development initiatives. The Themes of the event are:

- Carbon Capture, Utilisation, and Storage.

- Climate Change: Modelling, Extremes, Urban Climate and Impacts.

- Ecosystem Services, Biodiversity Conservation and Urban Ecology.

- Environment and Human Health.

- Environmental Microbiology and Biotechnology.

- Environmental Pollution and Sustainable Solutions.

- Food Systems: Agriculture, Agroforestry and Green Initiatives.
- Life Cycle Assessment of Plastics and its Recycling Process.
- Mission LiFE and Sustainable Development Goals (SDGs).
- Natural Resources Management.
- Natural Hazards and Disaster Management.
- Remote Sensing and Environmental Monitoring.
- Renewable Energy and Circular Economy.

For further details, contact Convener, Prof. Kasturi Mukhopadhyay, School of Environmental Sciences, Jawaharlal Nehru University, New Delhi-110067, Phone No: 011-26704302/03/04, E-mail: *anamnesis2025@gmail.com.* For updates, log on to: *www.jnu.ac.in/events/*

International Conference on Computer Vision and Deep Learning

A two-day International Conference on 'Computer Vision and Deep Learning' is being organised by the Lovely Professional University, Phagwara, Punjab, from October 09-10, 2025. The event aims to facilitate in-depth discussions on groundbreaking research, foster collaborations across disciplines, and showcase practical applications of computer vision in a range of sectors. The researchers, practitioners, and industry leaders may participate in the event to explore the latest innovations and trends in computer vision and deep learning-based systems. The Technical Tracks of the event are:

I. **Machine Learning and Deep Learning: Emerging Innovations**

- *Supervised Learning Advances*

  New algorithms and methods for improving classification and regression tasks.

- *Unsupervised Learning Innovations*

  Techniques in clustering, anomaly detection, and generative models.

- *Reinforcement Learning Progress*

  Improved algorithms for decision-making in uncertain environments, such as Q-learning and policy gradient methods.

- *Neural Networks*

  Innovations in architectures like Convolutional Neural Networks (CNNs), Recurrent Neural Networks (RNNs), and Transformer models.

- *Transfer Learning*

  Applying knowledge from pre-trained models to new, related tasks, reducing training time and data requirements.

- *Scalability and Efficiency*

  Techniques for scaling AI models for large datasets and computational resources, improving performance and reducing energy consumption.

- *Challenges*

  Addressing issues like model interpretability, robustness, and bias in AI systems.

II. **Natural Language Processing (NLP): Advances in Language Understanding**

- *Language Models*

  Advances in pre-trained models like GPT, BERT, and T5 that improve text generation, summarization, and understanding.

- *Machine Translation*

  Enhancements in automatic translation across languages using neural machine translation and transformer models.

- *Sentiment Analysis*

  Improved techniques for analyzing and understanding emotions in text, used in customer feedback, social media, and reviews.

- *Conversational AI*

  Development of more human-like chatbots and virtual assistants through context-aware and multi-turn dialogue systems.

- *Contextual Understanding*

  Leveraging attention mechanisms and context embeddings to improve sentence and paragraph-level language comprehension.

- *Low-resource NLP*

  Techniques for improving language models for less-represented languages and domains.

III. **Computer Vision: New Techniques and Applications**

- *Image Recognition*

  Advances in object detection, classification, and segmentation using deep learning techniques.

- *Video Analysis*

  Real-time video processing for applications like surveillance, facial recognition, and action detection.

- *Augmented Reality (AR)*

  Techniques for overlaying digital information onto the real world, enhancing user experiences in entertainment and industrial applications.

- *Autonomous Vehicles*

  Vision-based AI for navigation, obstacle detection, and decision-making in self-driving cars.

- *Healthcare Applications*

  Use of computer vision for medical image analysis, such as MRI, X-ray, and ultrasound, for diagnosing diseases.

- *Security and Surveillance*

  Advanced AI-driven systems for monitoring public spaces, detecting anomalies, and preventing potential threats.

- *Entertainment and Media*

  Applications in video games, virtual production, and special effects, enhancing realism and immersion.

IV. Cognitive Computing: AI and Human-like Decision-Making

- *Cognitive Architectures*

  AI frameworks that model human cognition, such as SOAR and ACT-R, enabling machines to simulate human-like thought processes.

- *Decision-Making Algorithms*

  Techniques like Markov Decision Processes (MDPs), heuristics, and Bayesian inference for automated reasoning and problem-solving.

- *Problem-solving Methods*

  AI-driven approaches to solve complex problems using search algorithms, optimization, and pattern recognition.

- *Cognitive Modeling*

  Simulating human cognitive processes to understand perception, memory, and learning, applied in robotics and AI assistants.

- *Autonomous Systems*

  AI systems that can make independent decisions in dynamic environments, such as drones, robots, and intelligent agents.

- *Business Decision-Support Tools*

  AI tools that assist with high-level decision-making in finance, operations, and strategic planning.

- *Government and Public Sector Applications*

  AI for policy analysis, public safety, and resource management, improving decision-making in governance.

V. AI in Healthcare: Revolutionizing Medical Diagnosis and Treatment

- *Medical Diagnostics*

  AI-powered tools for early disease detection, such as cancer, heart disease, and rare conditions using image and genomic data.

- *Treatment Planning*

  Algorithms that assist doctors in creating personalized treatment plans based on patient data and medical history.

- *Personalized Medicine*

  AI-driven approaches to tailor treatments based on individual genetic profiles and lifestyle factors.

- *Precision Medicine*

  Integration of AI with genomics and proteomics to provide more accurate diagnosis and targeted therapies.

- *Disease Detection*

  Use of AI in radiology, pathology, and dermatology for identifying anomalies in medical images.

- *Patient Care*

  AI systems to monitor patient health remotely, detect early signs of complications, and provide continuous care.

- *AI Tools for Healthcare Practitioners*

  Decision-support systems that help doctors analyze vast amounts of medical data to make informed decisions faster.

- *Robotics in Surgery*

  AI-assisted robotic systems that enable more precise and minimally invasive surgical procedures.

For further details, contact, Dr. Parminder Singh, Professor, School of Computer Science

and Engineering, Lovely Professional University, Phagwara, Punjab- 144411, E-mail: *aicc@lpu.co.in.* For updates, log on to: *www.lpu.in/event/*

National Seminar on Crystallography and Drug Design

A three-day National Seminar on 'Crystallography and Drug Design' is being organised by the Department of Bioinformatics, Pondicherry University, Pondicherry, in collaboration with the Indian Crystallographic Association from September 24-26, 2025. The event aims to bring together prominent scientists, academics, researchers, and students in the area to share thoughts about crystallography, its uses, and related advancements. The themes of the event are:

- Macromolecular Crystallography.
- Structural Bioinformatics.
- Small Molecule Crystallography.
- Crystallography in drug design and pharmaceuticals.
- Crystal growth and characterisation.
- Crystals for device applications.
- *In situ* Cryo-and high temperature-crystallography.
- Synchrotron radiation, Small-angle X-ray Scattering.
- Mechano-responsive Crystals.
- Powder diffraction & Rietveld refinement.
- Quantum Crystallography & Chemical Bonding.
- Metal /non-Metal-organic frameworks.
- Solid State Nuclear Magnetic Resonance.
- Functional materials: structure and defects.
- Smart and advanced Materials.
- Electron and Neutron Diffraction.
- Crystals for Molecular Magnetism.

For further details, contact Organising Secretary: Dr. M. Suresh Kumar, Department of Bioinformatics, Pondicherry University, Pondicherry-605014, Mobile No: 09486267366, E-mail: *nsc52@bicpu.edu.in.* For updates, log on to: *www.pondiuni.edu.in/events*

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THESES OF THE MONTH

BIOLOGICAL SCIENCES

Biochemistry

1. Chatupale, Vaidehi. **Understanding the physiological and genetic basis of bacterial longevity in streptomyces flaviscleroticus**. (Dr. Jayashree Pohnerkar), Department of Biochemistry, M S University of Baroda, Vadodara.

Bioinformatics

1. Ambedkar, Rahul Dev. **Studies on protein-ligand interactions in Sars CoV 2**. (Prof. Amar P Garg and Dr. Payal Mago), Department of Bioinformatics, Shobhit Institute of Engineering & Technology Deemed to be University, Meerut.

2. Nagamani, J J Venkata. **Artificial intelligence driven multi OMICS approach for the identification of prognostic markers in dengue infection**. (Dr. M Srinivasa Rao), Faculty of Biological Sciences, Academy of Scientific and Innovative Research, Ghaziabad.

Biology

1. Arora, Rashmi. **Investigating the role of nuclear receptors in autophagy related diseases**. (Dr. Pawan Gupta), Faculty of Biological Sciences, Academy of Scientific and Innovative Research, Ghaziabad.

2. Hossain, Md Mehedi. **Screening and identification of small molecule inhibitor(s) of JAK-STAT signaling pathway and their impact on biological activities**. (Dr. Mohd Jamal Dar), Faculty of Biological Sciences, Academy of Scientific and Innovative Research, Ghaziabad.

3. Kapoor, Kamini. **Understanding the role of glycine rich protein in cucumber mosaic virus pathogenesis**. (Dr. Vipin Hallan), Faculty of Biological Sciences, Academy of Scientific and Innovative Research, Ghaziabad.

4. Kriti, K B. **Elucidating the non-epigenetic roles of distinctly localised euchromatic histone lysine methyltransferase 1, (EHMT1/KMT1D)**. (Dr. Shravanti Rampalli and Dr. Chetana Sachidanandan), Faculty of Biological Sciences, Academy of Scientific and Innovative Research, Ghaziabad.

5. Mishra, Bhavya Priyadarshini. **Comparative transcriptome profiling of *Citrus indica* for identification and validation of major gene(s) involved in limonene biosynthesis**. (Dr. T S Rana and Dr. K N Nair), Faculty of Biological Sciences, Academy of Scientific and Innovative Research, Ghaziabad.

6. Raybarman, Chandan. **Repurposing *Gabapentin and Pregabalin* as anti-proliferative and antibacterial agents**. (Dr. Surajit Bhattacharjee and Dr. Pratap Chandra Acharya), Department of Molecular Biology and Bioinformatics, Tripura University, Suryamaninagar.

Biotechnology

1. Dash, Pratigyan. **Cell membrane coated nanoparticles as vectors for delivery of aminated bisphosphonate and nucleic acid: An approach for osteosarcoma management**. (Dr. Mamoni Dash and Dr. Tithi Parija), Department of Biotechnology, Kalinga Institute of Industrial Technology, Bhubaneswar.

2. Gayathri, K. **Receptor-mediated nano-drug delivery and tumor microenvironment immunomodulation in gliomas and melanomas**. (Dr. Rajkumar Banerjee and Dr. P Naga Prasad), Faculty of Biological Sciences, Academy of Scientific and Innovative Research, Ghaziabad.

3. Ghosh, Dipayan. **Morpho-anatomical, phytochemical and molecular investigation of *Cannabis sativa* L for identification of CBD-rich genotype(s)**. (Dr. Narendra Kumar), Faculty of Biological Sciences, Academy of Scientific and Innovative Research, Ghaziabad.

4. Gupta, Priyanka. **Understanding the molecular basis of essential oil biosynthesis in aromatic grasses (*Cymbopogon sp.*)**. (Dr. Dinesh A Nagegowda), Faculty of Biological Sciences, Academy of Scientific and Innovative Research, Ghaziabad.

5. Indrajeet Singh. **Investigations on anti cancerous properties of various extracts and purified compounds from piper longum root**. (Dr. Ajay Kumar), Department of Biotechnology, Rama University, Kanpur.

6. Reeta. **In vitro studies on the effects of selected herbal extracts on the microflora of healthy and dandruff scalp**. (Dr. Alpana Joshi and Dr. Subrata Kr Das), Department of Biotechnology, Shobhit Institute of Engineering & Technology Deemed to be University, Meerut.

Life Science

1. Dutta, Prasanna. **The isolation and functional characterization of arsenic responsive gene from a primitive liverwort**. (Dr. Debasis Chakrabarty), Faculty of Biological Sciences, Academy of Scientific and Innovative Research, Ghaziabad.

2. Sajjadi, Sara. **Genetic and epigenetic basis of vitamin D mediated fetal programming of cardiometabolic phenotypes**. (Dr. G R Chandak), Faculty of Biological Sciences, Academy of Scientific and Innovative Research, Ghaziabad.

Zoology

1. Maqbool, Nafee. **Exploration of gut bacterial flora of cultured trout fishes in Kashmir Valley with particular reference to their probiotic potential**. (Prof. Fayaz Ahmad), Department of Zoology, University of Kashmir, Srinagar.

2. Mukherjee, Swagatama. **Role of GBM derived extracellular vesicles in drug resistance, non-tumor cell interaction and epithelial-mesenchymal transition**. (Dr. Prakash P Pillai), Department of Zoology, M S University of Baroda, Vadodara.

EARTH SYSTEM SCIENCES

Atmospheric Science

1. Navin Chandra. **Study of oceanic mesoscale eddies in the Bay of Bengal using a numerical model**. (Prof. Vimlesh Pant), Centre for Atmospheric Science, Indian Institute of Technology Delhi, New Delhi.

2. Jaswant. **Long-term trend of cloud fraction over the Indian ocean in the warming era**. (Prof. Sagnik Dey and Prof. Vimlesh Pant), Centre for Atmospheric Science, Indian Institute of Technology Delhi, New Delhi.

Microbiology

1. Singh, Ashish Kumar. **Molecular characterization and microcosm studies of denitrifying methanotrophs from environmental samples**. (Dr. Anshuman Khardenavis), Faculty of Biological Sciences, Academy of Scientific and Innovative Research, Ghaziabad.

ENGINEERING SCIENCES

Biochemical Engineering

1. Sakshi. **Metabolic engineering of zymomonas mobilis for acetoin, D-(-)-2,3- butanediol and valine branch intermediate production**. (Prof. Ashish Misra), Department of Biochemical Engineering & Technology, Indian Institute of Technology Delhi, New Delhi.

Biomedical Engineering

1. Gaur, Vidit. **Combinatorial approaches to mitigate the challenges with CD40 agonist antibody for durable anti-tumor immunity**. (Prof. Jayanta Bhattacharyya), Centre for Biomedical Engineering, Indian Institute of Technology Delhi, New Delhi.

2. Pal, Sweety. **Design and fabrication of biosensor for measurements of glucose and urea in single blood sample**. (Dr. Sudesh Kumar Shukla), Department of Biomedical Engineering, Shobhit Institute of Engineering & Technology Deemed to be University, Meerut.

Chemical Engineering

1. Atrey, Isha. **Controlled electrochemical exfoliation of HOPG for monoplayer, bilayer and trilayer graphene synthesis**. (Prof. Anupam Shukla), Department of Chemical Engineering, Indian Institute of Technology Delhi, New Delhi.

2. Punia, Rajat. **Computational characterization of cooperatives dynamics and large scale conformational transitions in biomolecules and their assemblies**. (Prof. Gaurav Goel), Department of Chemical Engineering, Indian Institute of Technology Delhi, New Delhi.

Civil Engineering

1. Mhaski, Sourabh. **Geohazard dynamics: SPH-driven engineering approach**. (Prof. G V Ramana), Department of Civil Engineering, Indian Institute of Technology Delhi, New Delhi.

2. Shah, Kushang Vinodbhai. **Development of leak detection strategies and identification of contamination source for water distribution system**. (Prof. H M Patel), Department of Civil Engineering, M S University of Baroda, Vadodara.

Computer Science & Engineering

1. Bhatnagar, Amrita. **Intrusion detection techniques for cyber attacks**. (Prof. Arun Kumar Giri and Dr. Aditi Sharma), Department of Computer Science & Engineering, Shobhit Institute of Engineering & Technology Deemed to be University, Meerut.

2. Malik, Vaishali. **Opinion analysis on selected global issues from twitter by utilizing machine learning techniques**. (Dr. Nidhi Tyagi), Department of Computer Science & Engineering, Shobhit Institute of Engineering & Technology Deemed to be University, Meerut.

3. Poonia, Amarjeet. **Brest cancer detection based on mammograms and tomosynthesis data using deep boosted hybrid learning algorithms**. (Prof V K Sharma and Dr. Hari Kumar Singh), Department of Computer Science and Engineering, Bhagwant University, Ajmer.

4. Rajiv Kumar. **Brest cancer prophecy and prognosis prospects by using machine learning approach**. (Dr. Nishant Pathak), Department of Computer Science & Engineering, Shobhit Institute of Engineering & Technology Deemed to be University, Meerut.

5. Siva Krishna, K. **Iot-based assessment of environmental pollution and its impact on lung diseases with a recommendation system**. (Dr. Jyotirmaya Mishra and Dr. T Satish), Department of Computer Science & Engineering, GIET University, Gunupur.

6. Sudarsa, Dorababu. **Enhancing secure data storage and sharing in the dynamic cloud groups**. (Dr. A Nagaraja Rao and Dr. A P Siva Kumar), Department of Computer Science & Engineering, Jawaharlal Nehru Technological University Anantapur, Ananthapuramu.

Electrical & Electronics Engineering

1. Nayak, Debi Prasad. **Accurate loss modelling for active thermal control of SiC converters**. (Prof. Sumit Kumar Pramanick), Department of Electrical Engineering, Indian Institute of Technology Delhi, New Delhi.

2. Pathak, Pankaj. **Magnetoelectric heterostructure-based nanodevices for spintronic and compact lab-on-a-chip applications**. (Prof. Dhiman Mallick), Department of Electrical Engineering, Indian Institute of Technology Delhi, New Delhi.

3. Pattepu, Sunil. **UAVs assisted cooperative communication networks for smart health care: A machine learning approach**. (Dr. Amlan Datta), KIIT School of Electronics Engineering, Kalinga Institute of Industrial Technology, Bhubaneswar.

4. Verma, Anumeha. **Segmentation of retinal structures using image processing and deep learning techniques with applications in retinal disease prediction**. (Prof. Monika Aggarwal), Centre for Applied Research and Electronics, Indian Institute of Technology Delhi, New Delhi.

Electronics & Communication Engineering

1. Jadda, Amarendra. **Optimized fuzzy wavelet neural network with adaptive wiener filtering for improved speech enhancement**. (Dr. I Santi Prabh), Department of Electronics & Communication Engineering, Jawaharlal Nehru Technological University, Kakinada.

2. Shaik, Allabaksh. **Deep learning based object detection approaches for enhancing anamoly identification in pedestrain ways**. (Dr. Shaik Mahaboob Basha), Department of Electronics & Communication Engineering, Jawaharlal Nehru Technological University Anantapur, Ananthapuramu.

3. Thamanam, Srinivasa Rao. **Advancements in edge-preserving image denoising: Deep learning and adaptive frameworks**. (Dr. K. Manjunathachari and Dr. K. Satya Prasad), Department of Electronics & Communication Engineering, Jawaharlal Nehru Technological University, Kakinada.

Mechanical Engineering

1. Gupta, Ravindra Mohanlal. **Investigation of heat transfer enhancement using hybrid passive techniques**. (Dr. Arvind S Mohite), Department of Mechanical Engineering, M S University of Baroda, Vadodara.

2. Mohol, Shubham Shankar. **Experimental investigations into embedded direct ink writing of triple-shape memory polymer blend for biomedical application**. (Prof. P M Pandey and Prof. Sunil Jha), Department of Mechanical Engineering, Indian Institute of Technology Delhi, New Delhi.

Textile & Apparel Design

1. Omender. **Design and development of high energy absorbent aircrew helmet using 3D woven structural composites**. (Prof. B K Behera), Department of Textile and Fibre Engineering, Indian Institute of Technology Delhi, New Delhi.

MATHEMATICAL SCIENCES

Mathematics

1. Bano, Tarannum. **Some optimum inventory policies for non- instantaneous deteriorating items**. (Dr. B K Chaturvedi and Dr. Jyoti Gupta), Department of Mathematics, Bhagwant University, Ajmer.

2. Bhardwaj, Varuna. **Development of mathematical green supply chain models the fuzzy environment**. (Dr. Vipin Kumar Tyagi Dr. Sunil Kumar), Department of Mathematics, Shobhit Institute of Engineering & Technology Deemed to be University, Meerut.

3. Chishti, Mahnaz Shafi. **Location of zeros and critical points of a complex polynominal in a disk**. (Dr. Vipin Kumar Tyagi Dr. Mohammad Ibrahim Mir), Department of Mathematics, Shobhit Institute of Engineering & Technology Deemed to be University, Meerut.

4. Gupta, Sonu. **Optimum inventory policies for decaying items and its applications**. (Dr. B K Chaturvedi and Dr.Jyoti Gupta), Department of Mathematics, Bhagwant University, Ajmer.

5. Khan, Tehseen Abas. **A study of biocomplex normal and quasi normal families**. (Dr. Jyoti Gupta and Dr. Ravinder Kumar), Department of Mathematics, Bhagwant University, Ajmer.

6. Patel, Krupanshibahen Narendrabhai. **Extension to certain hypergeometric polynomials and their properties**. (Prof. B I Dave), Department of Mathematics, M S University of Baroda, Vadodara.

7. Priya, K. **Inquisition of distinct domination parameters in graphs**. (Dr. G Mahadevan), Department of Mathematics, The Gandhigram Rural Institute-Deemed University, District Dindigul.

8. Raja Priyanka, K. **Synchronization analysis for discrete-time neural networks with time delays**. (Dr. G Nagamani), Department of Mathematics, The Gandhigram Rural Institute-Deemed University, District Dindigul.

9. Rashmi Rani. **A mathematical study on genetic fuzzy controllers using fuzzy methods and its applications**. (Dr. Manoj Kumar), Department of Mathematics, Bhagwant University, Ajmer.

MEDICAL SCIENCES

ENT

1. Singh, Usha. **Clinicopethological profile of sinohasal mass-hospital based study**. (Dr. Vineet Sinha), Department of ENT, Aryabhatta Knowledge University, Patna.

Pharmaceutical Science

1. Dubey, Trupti. **Pharmacological evaluation of some herbs in experimentally induced rheumatoid arthritis along with cardiovascular complications**. (Dr. Kirti Patel), Department of Pharmacy, M S University of Baroda, Vadodara.

2. Srilakshmi, S. **Development of novel synthetic heterocyclics as potential drug resistance reversal agents against MDRTB**. (Dr. M Murali Krishna Kumar and Dr. Y Srinivasa Rao), Department of Pharmacy, Jawaharlal Nehru Technological University, Kakinada.

PHYSICAL SCIENCES

Chemistry

1. Gutta, Rama Devi. **Investigations on biological activities of polyazole transition metal complexes**. (Dr. Abdul Rajack and Dr. S Satya Veni), Department of Chemistry, Jawaharlal Nehru Technological University, Kakinada.

2. Lodhi, Gajendra Singh. **Flame synthesis of modified functional metal oxides nanoparticles in industrial applications**. (Dr. Jyoti Sharma and Dr. Laxman Singh), Department of Chemistry, Shobhit Institute of Engineering & Technology Deemed to be University, Meerut.

3. Malik, Asif Ahmad. **Crystal engineering of the pharmaceuticals for material applications**. (Dr. Aijaz Ahmad Dar and Dr. Peer Abdul Haseeb Shah), Department of Chemistry, University of Kashmir, Srinagar.

4. Parmar, Heena. **Use of ferrocene functionalized 2° amine and alcohol precursors in the development of hetero multi-metallic 1,1-Dithio ligands with potential applications**. (Dr. Vinay Kumar Singh), Department of Chemistry, M S University of Baroda, Vadodara.

5. Shajrath Din. **Isolation characterization and biological evaluation of bioactive principal constituents of various invasive plants in Kashmir Valley**. (Prof. Manzoor Ahmad Shah), Department of Chemistry, University of Kashmir, Srinagar.

6. Vikas. **Utilizing machine learning and optical simulations for spectroscopic probing of biological systems**. (Prof. Soumik Siddhanta), Department of Chemistry, Indian Institute of Technology Delhi, New Delhi.

Physics

1. Chaudhary, Hardipkumar Shankarbhai. **Effect of magnetic field on growth, development and yield of crops**. (Dr. Kaushikkumar Ruganathbhai Patel and Dr. Prateek Shilpkar), Department of Physics, Gujarat Vidyapith, Ahmedabad.

2. Dadhich, Mukesh. **Power output through wind and solar photovoltaic hybrid system and its implementation in electric vehicles**. (Dr. Rajiv Kumar Singh), Department of Physics, Bhagwant University, Ajmer.

3. Dey, Sharmistha. **Correlation between electronic structure and magnetic properties of MoO_3 and MoS_2**. (Prof. Santanu Ghosh and Prof. Pankaj Srivastava), Department of Physics, Indian Institute of Technology Delhi, New Delhi.

4. Omshankar. **Robust entangled-photon sources based on PPKTP for rotational-misalignment-resilient free-space QKD**. (Prof. Joyee Ghosh), Department of Physics, Indian Institute of Technology Delhi, New Delhi.

5. Pandey, Saurabh. **Resonant nanophotonics in periodic lattices for solar energy harvesting and electrochemical applications**. (Prof. Joby Joseph), Department of Physics, Indian Institute of Technology Delhi, New Delhi.

6. Sharma, Jitesh Chandrapal. **Synthesis and characterization of rare earth doped metal oxide phosphors**. (Dr. Y H Gandhi), Department of Applied Physics, M S University of Baroda, Vadodara.

7. Srivastava, Shikha. **Investigation of multifaceted applications of BaSnO3: Ceramic and thin film**. (Dr. Anjana Dogra), Faculty of Physical Sciences, Academy of Scientific and Innovative Research, Ghaziabad.

8. Sweta Kumari. **A combined empirical and modeling approach to study atmospheric aerosols and their impact on Sikkim Himalayan Region, India**. (Dr. Anirban Middey), Faculty of Physical Sciences, Academy of Scientific and Innovative Research, Ghaziabad. ❑

भारतीय प्रौद्योगिकी संस्थान दिल्ली

Indian Institute of Technology Delhi
Hauz Khas, New Delhi – 110 016.   Website : www.iitd.ac.in

Advt. No. E-II/14/2025 (Deputation) dated August 07, 2025

ONLINE Applications are invited from the Indian Nationals for filling up for the following post on **Deputation basis**: -

S. No.	Name of the Post	Cadre	Group	No. of Vacancies	Pay Matrix as per 7th CPC	Age Limit
01	Deputy Registrar	Administration	A	04	Level 12	56 years

How to apply:

For further details/ information regarding qualification, experience, general instructions etc., kindly visit the Institute website, viz. https://home.iitd.ac.in/jobs-iitd/index.php (Group- 'A', 'B' & 'C' positions under Non-Academic positions tab). **The last date for submission of application through ONLINE MODE is 22.09.2025.**

(Recruitment Cell)
IIT Delhi

Wanted

Applications are invited for the post of **Assistant professor** in filled in **Vivek Vardhini Adhyapika (B.Ed) Mahavidyalaya, Nanded (permanent Non-Granted)** run by Marathwada Gramin Shikshan Sanstha's Himayatnagar. Eligible candidates should submit their application along-with all necessary documents **within Fifteen days** from the date of publication of the Advertisement by registered post only.

Sr.	Subjects (B.Ed)	No. of posts	Nature	Reservation
1	Perspective in Education	4	Regular	SC-**01**, ST-**01**, VJ(A)-**01**, OBC-**01**, SEBC **01**, EWS **01**
2	Pedagogy Subjects (Math, Science, Social Science , Language)			
3	Health and Physical Education	2	Part Time	
4	Performing Arts (Music / Dance / Theatre) Fine Arts			

Note: As per Government Decision dated 25/01/2024 parallel reservation should be strictly implemented in recruitment parallel reservation is as follows – Women-2

Educational Qualification: The faculty shall possess the following qualifications:

A) : Perspective in Education or Foundation Courses
1. Post Graduate Degree in Social Science with minimum 55% marks. **2.** M.Ed Degree from a recognized University with minimum 55% marks. **3.** SET/NET/Ph.D in Education

OR

1. Post Graduate (M.A.) Degree in Education with minimum 55% marks **2.** B.Ed / B.E/.ED. Degree in Education with minimum 55% marks
3. SET/NET/Ph.D in Education

B) : Curriculum and Pedagogic Courses
1. Post Graduate Degree in Science/Mathematics/Social Sciences/Languages with minimum 55% marks. **2.** M.Ed Degree from a recognized University with minimum 55% marks. **3.** SET/NET/Ph.D in Education

C) : Health and Physical Education
1. Master of physical Education (M.P.Ed) with minimum 55% marks. **2.** SET/NET/Ph.D in Physical Education

D): Performing Arts (Music /Dance /Theatre) Fine Arts
1. Post Graduate Degree in Fine Arts (MFA) with minimum 55% marks
OR
1. Post Graduate Degree in Music / Dance / Theatre Arts with minimum 55% marks **2.** SET/NET/Ph.D in Fine Arts.

Salary and Allowances:
Pay scale as per the UGC, State Government & Swami Ramanand Teerth University's rules from time to time.

Note:
1. Prescribed Application Form is available on University Website **(www.srtmun.ac.in) 2.** No TA/DA will be paid to attend the interview. **3.** Eligible Candidates who are already in services should submit their application through proper channel. **4.** 3% Reservation for handicapped and 30% for women candidate. **5.** All attested Zerox Copies of certificates and other relevant documents should be attached to the application form.

Address for correspondence: President/Secretary, Vivek Vardhini Adhyapika (B.Ed) Mahavidyalaya,
Plot No.8C Industrial Estate, Stadium Road, Shivajinagar Nanded.431601

President/Secretary

Wanted

Applications are invited for the post of Principal to be filled in **Vivek Vardhini Adhyapika (B-Ed) Mahavidyalaya, Nanded (permanent Non-Granted)** run by Marathwada Gramin Shikshan Sanstha's Himayatnagar. Eligible candidates should submit their application along-with necessary documents **within Fifteen days** from the date of publication of the Advertisement by registered post only.

Sr. No.	Name of the post	No. of post	Reservation
1	Principal	01	(unreserved)

Educational Qualifications:

1. Postgraduation degree in Arts/Sciences/Social Sciences/Humanities/Commerce with minimum 55 % Marks and **2.** M.Ed. with minimum 55 % Marks and **3.** Ph.D. in Education or any Pedagogic subject offered in the institution and **4.** Ten years of teaching experience in a Secondary Teachers Education Institutions provided that, in the event of non-availability of eligible and suitable candidates for appointment as Principal/Head as per above eligibility criteria, it would be permissible to appoint retired Professor/Head in Education on contract basis for a period not exceeding one year at a time till such the candidates complete Sixty five years of age.

The term of appointment of the college principal shall be tenure with eligibility for reappointment for one more term only after a similar selection committee process.

Salary and Allowances
Pay scale as per the UGC, State Government & Swami Ramanand Teerth University"s rules from time to time (Pay scale Rs.37400-67000+AGP Rs.10000)

Note:

1. Prescribed Application Form is available on University Website (**www.srtmun.ac.in**).
2. No TA/DA will be paid to attend the interview.
3. Eligible candidates who are already in service should submit their application through proper channel.
4. All attested Xerox copies of certificates and other relevant documents should be attached to the application form.

Address for correspondence: President/Secretary, Vivek Vardhini Adhyapika (B.ED) Mahavidyalaya, Plot No. 8C Industrial Estate, Stadium Road, Shivajinagar Nanded-431601

President / Secretary

Kopargaon Taluka Education Society's
K. J. Somaiya College of Arts, Commerce & Science,
Kopargaon Dist. Ahilyanagar. Pin-423 601 (Estd. 1964)
Ph. No. - 02423-222054, 9422008049

WANTED

Applications are invited from eligible candidates for the following grant-in-aid post.

Sr. No.	Designation	Total Post	Category
1	Principal	01	Open to all

Terms & Conditions:-

1. Educational Qualifications & other essential requirements, Pay Scale and service conditions are as prescribed by U.G.C., New Delhi, Govt. of Maharashtra and Savitribai Phule Pune University, Pune. **2.** Associate Professor / Professor with the total experience of 15 years in teaching/research/administration in Universities, Colleges and other Institutions of Higher Education. **3.** Candidate should submit their Certificate of API as per the UGC norms. **4.** The appointment for the said post will be for tenure of five years from the date of appointment or up to attainment of the age of superannuation of the candidate, whichever is earlier. **5.** A candidate who is in service should send the application through proper channel. **6.** No. TA/DA will be payable to the candidates appearing for the interview. **7.** This recruitment procedure is subject to the decision of the Hon. Court on Writ Petition No. 12051/2015. **8.** Kindly send a demand draft of Rs. 400/- along with application form in favour of "The Secretary, Kopargaon Taluka Education Society, Kopargaon" Payable at Kopargaon. **9.** Application along-with Photocopies of all the relevant documents should reach at following address **within 30 days** from the date of publication of this advertisement.

Address :-

The Chairman/Secretary, Kopargaon Taluka Education Society c/o- K. J. Somaiya College of Arts, Commerce & Science Mohanirajnagar, Kopargaon-423601, Dist. Ahilyanagar, (MH.)

Secretary	**Chairman**

Kopargaon Taluka Education Society, Kopargaon.

D.S.T.S. MANDAL'S COLLEGE OF PHARMACY, SOLAPUR
Jule Solapur – 1, Vijapur Road, Solapur – 413 004
Kannada Linguistic Minority Institute
☎:(0217) 2343760 Email: pharmacycol@yahoo.com Visit us at:www.pharmacycol.com
(Approved by P.C.I., New Delhi, Affiliated to P. A. H. Solapur University, Solapur)

Applications are invited for the Post of PRINCIPAL from the Academic Year 2025-26:

Sr. No.	Designation	Total Vacant Posts
1	Principal	01

The above post is open to all, however, candidates from any category can apply for the post.

Education Qualifications, Service Conditions, Pay Scales will be applicable as per existing rules prescribed by Govt. of Maharashtra, Higher & Technical Education Department, Government Resolution No. सावेआ–1111 / प्र.क्र.44 / 19 / तां.शि.2, दि. 11 सप्टेंबर, 2019.

A relaxation of 5 % shall be allowed at the Bachelors as well as at the Masters level for the candidates belonging to SC/ST/OBC (Non-creamy Layer)/Differently-abled for the purpose of eligibility and assessing good academic record for direct recruitment.

Reserved candidates, who are domiciled out of Maharashtra State, will be treated as Open Category candidates.

Applications received after the last date will not be considered. The College will not be responsible for postal delay.

Applicants who are in service must send their application through proper channel.

Applicants are required to account for breaks, if any, in their academic career. Incomplete applications will not be entertained. TA/DA will not be paid for attending the interview.

Applications with full details should reach to the **Chairman, D.S.T.S. Mandal's College of Pharmacy, Solapur within 30 days from the date of publication of this advertisement**. Incomplete applications will not be entertained.

This is University approved advertisement.

Place: Solapur	R.V. Shivdare
Date: 08/09/2025	Chairman

Sangrul Education Society's

S. B. Khade Mahavidyalaya, Koparde

Tal Karveer, Dist Kolhapur – 416 (Maharashtra)

(Permanently Granted)

WANTED

Applications are invited from eligible candidates for the following post:-

Sr No	Name of the Post	Vacant Post	Reservation
1	Principal	01	Open to All - 01

Place – KOPRADE

Date - / 09/ 2025

President/Secretary
Sangrul Edcuation Society, Sangrul
Tal. Karveer, Dist. Kolhpaur – 416 205

Note – For detailed information about post, qualifications and terms and conditions, please visit Shivaji University **website : www.unishivaji.ac.in.**

Hindi Vidya Prachar Samiti's

RAMNIRANJAN JHUNJHUNWALA COLLEGE OF ARTS, SCIENCE & COMMERCE

(Empowered Autonomous)

Opposite Ghatkopar Railway Station, Ghatkopar West, Mumbai 400086.

ADVERTISEMENT FOR ADMISSION to Ph.D. in PHYSICS AND ZOOLOGY

The Research Centre of R. J College of Arts, Science & Commerce, Ghatkopar, Mumbai (Affiliated to University of Mumbai) invites applications for **Ph.D** in the following subjects **Physics and Zoology** for the first half of the academic year 2025-26 from the eligible candidates

Eligibility:

Ph.D (As per the Ordinance 0.5473, 05476 of the University of Mumbai as mentioned in the VCD No. Exam./Thesis/Uni./VCD/2414 of 2010, refer also to VCD No. Exam./Thesis/Uni./VCD/947 of 2018)

• NET/SET/PET/GATE or any other qualifying exams approved by UGC

• Minimum 55% Marks at M.Sc/M.A/M.Com and 50% for Reserved Category.

Photocopies of the following Documents must be submitted along-with completed Application Form:

• Appropriate Mark list and degree certificates

• Appropriate Caste certificates, if applicable

• PET/NET/SET/GATE. Etc. Certificate

Pre-Application Forms are available in the office.

Last Date for acceptance of completed application form: **18th September, 2025 (Till 1.00 pm)**

All the eligible candidates will be invited for interviews in the Fourth week of September 2025 (the date will be announced later).

St. Peter Education and Welfare Society's
St. Peter Degree College

At. St. Peter Educational Campus, Diwanman, Vasai West, Tal-Vasai, Dist-Palghar-401202

MINORITY INSTITUTE

APPLICATIONS ARE INVITED FOR THE FOLLOWING POSTS FROM THE ACADEMIC YEAR 2025-2026:

UNAIDED

Sr. No	Cadre	Subject	Total No. of Posts	Category
1.	Principal	--	01	01-OPEN
2.	Assistant Professor	Commerce	02	02-OPEN
3.	Assistant Professor	Management	02	02-OPEN
4.	Assistant Professor	History	01	01-OPEN
5.	Assistant Professor	Economics	01	01-OPEN
6.	Assistant Professor	Political Science	01	01-OPEN
7.	Librarian	--	01	01-OPEN

The above posts are open to all, however, candidates from any category can apply for the post.

Reservation for women will be as per **University Circular No. BCC/16/74/1998 dated 10th March, 1998. 4% reservation shall be for the persons with disability as per University Circular No. Special Cell/ICC/2019-20/05 dated 05th July, 2019.**

Candidates having knowledge of Marathi will be preferred.

''Qualification, Pay Scales and other requirements are as prescribed by the UGC Notification dated 18th July, 2018, Government of Maharashtra Resolution No. Misc-2018/C.R.56/18/UNI-1, dated 8th March, 2019 and University circular No. TAAS/(CT)/ICD/2018-19/1241, dated 26th March, 2019 and revised from time to time."

The Government Resolution & Circular are available on the website: mu.ac.in.

Applicants who are already employed must send their applications through proper channel. Applicants are required to account for breaks, if any, in their academic career.

Applications with full details should reach the **CHAIRMAN, St. Peter Education and Welfare Society's St. Peter Degree College, At. St. Peter Educational Campus, Diwanman, Vasai West, Tal-Vasai, Dist-Palghar-401202 within 15 days** from the date of publication of this advertisement. **This is University approved advertisement.**

Sd/- **CHAIRMAN**

Deputy Registrar,
TAAS (CT)

The draft of advertisement in so far as it relates to reservation for women & physically handicapped is verified and found in order. He is requested to check the educational qualifications, Experience & pay-scale etc. at the time of final approval. Please note that the above para with regards to qualifications is changed as per letter no. TAAS/(CT)/IS/ICD/2018-19/90 dated 29/08/2019.

Deputy Registrar
(Special Cell)

Hind Seva Parishad's
PUBLIC LAW COLLEGE

Hind Nagar Aaram Society Road, Vakola Market. Santacruz(E), Mumbai - 400 055.

MINORITY

APPLICATIONS ARE INVITED FOR THE FOLLOWING POSTS FROM THE ACADEMIC YEAR 2025-2026.

UN-AIDED

Sr. No.	Cadre	Subject	Total No. of Posts	Category
1.	Principal	-	01	01-OPEN
2.	Assistant Professor	Law	02	02-OPEN
3.	Librarian	-	01	01-OPEN

The above posts are open to all, however, candidates from any category can apply for the post. Reservation for women will be as per **University Circular No. BCC/16/74/1998 dated 10th March, 1998. 4% reservation shall be for the persons with disability as per University Circular No. Special Cell/ICC/2019-20/05 dated 05th July, 2019.**

Candidates having knowledge of Marathi will be preferred.

"Qualifications, Pay Scales and other requirements are as prescribed by the UGC Notification dated 18th July, 2018, Government of Maharashtra Resolution No. Misc-2018/C.R.56/18/UNI-1, dated 8th March, 2019 and University circular No. TAAS/(CT)/ICD/2018-19/1241, dated 26th March, 2019 and revised from time to time." The Government Resolution & Circular are available on the **website: mu.ac.in**.

Applicants who are already employed must send their application through proper channel.

Applicants are required to account for breaks, if any, in their academic career.

Application with full details should reach the **SECRETARY, Public Law College, Vakola Market, Santacruz (E), Mumbai - 400 055 within 15 days** from the date of publication of this advertisement.

This is University approved advertisement.

Sd/-
SECRETARY

ASSOCIATION OF INDIAN UNIVERSITIES
AIU HOUSE, 16, COMRADE INDRAJIT GUPTA MARG, NEW DELHI-110 002

No.AIU/Admn/Rectt./2024/
Dated:04.09.2025

Vacancy Notification

The Association of Indian Universities (AIU), an apex Inter-University Organisation, invites applications from eligible candidates for engagement as *Young Professionals* on a contractual basis, The details of the engagement are as follows:

Post Name	Eligibility
Young Professional (Sports) (04 Positions)	Master's degree in Physical Education/Sports Management with 2 years of work experience with sports federations/universities/SAI, **OR** Master's degree in any discipline with 2 years of work experience in sports administration.
Young Professional (IT) (01 Position)	Bachelor in Technology (Computer Science)/ B.Sc. in Computer Science/ Bachelor of Computer Applications (BCA), with Minimum 03 years of experience in ASP.NET with C# (VS 2022) and SQL Server/PHP development (with expertise in WordPress customization and development)/Server Management/Financial & ERP Systems Knowledge, etc.
Age	Not exceeding 35 Yrs.
Remuneration	30,000 to 50,000/- per month
Period of engagement	One year (The Association reserves the right to curtail or extend the period)

General instructions:

1. The cut-off date for determining eligibility and age shall be the closing date for the receipt of applications.
2. Mere fulfillment of the prescribed eligibility criteria does not guarantee that a candidate will be called for a test or interview. The Association reserves the right to relax any of the stipulated conditions and to shortlist candidates as it deems appropriate.
3. No TA/DA will be provided to candidates for attending the test or interview.
4. The Association reserves the right not to fill any of the advertised post(s) without assigning any reason.
5. The Association also reserves the right to increase or decrease the number of post(s) to be filled, and may decide not to fill any post(s) at its discretion. The decision of the Association in this regard shall be final.
6. Completed applications in the prescribed format (Annexure A), along with the application fee of ₹500/- (through Demand draft in favour of Association of Indian Universities, payable at New Delhi) must be submitted in a sealed envelope super-scribed "Application for the post of ……………". The application should be addressed to the Secretary General, Association of Indian Universities, AIU House, 16, Comrade Indrajit Gupta Marg, New Delhi – 110 002, and must reach within 21 days from the date of publication of the advertisement in the newspaper.

For Details, please visit AIU's website: www.aiu.ac.in