Multidisciplinary Research: A Way From Interdisciplinary Form To Develop Sustainable Innovation Reframing Science And Technology In India

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Abstract

The evolution of multidisciplinary research paved the way to educationists, policy makers and evolutionists to provide the integration of natural sciences with human sciences, thereby providing a holistic view of technology on the basis of research and innovations. It further implies a transition from the significant change in the organization and management of the scientific change from the past decade. The present paper highlights the platform on the basis of which teaching and research persists in interdisciplinary centres and provide the learners the ground on which research of high quality will be generated. The high-indexed scientific articles and their citation in the patent literature provide contribution globally. The future scope of this paper is the inclusion of collaborative research for sustainable development through team research, thereby providing guidelines to future researchers and scientists in making India developed country.

Key Words

Multidisciplinary Research, Sustainable development, Team Research, SWOT, Nanotechnology

Introduction

Govt. of India (2005) & Yash Pal Committee (2009) studied that affiliating systems at graduate as well as Post graduate levels was divided & multidisciplinary education was not encouraged. Various commissions and committees did not favor multidisciplinary education from the point of view of governance and quality of affiliating systems. Yash pal Committee Report (2009) found that " An urge to expose student especially at undergraduate level in various disciplines is the need of the hour." Interdisciplinary education is the basis of education for the modern faculty, university as well as education. Modernization in education in India is brought through reframing policies of education in the form of Multidisciplinary education is one of the key feature in higher Education sector.

Ribereau, Gayon & David (2018). emphasized on Interdisciplinary research, the aim of which is to teach through engaging the learners for thinking critically rather than understand existing body of knowledge. This kind of research demands a team that is able to gather information, data, techniques, tools, concepts, theories from two or more disciplines. Solution of those problems beyond the scope of a single discipline or area of research practice is done through interdisciplinary approach.. Young (1995) found that Interdisciplinary teaching and research is more fruitful as compared to multidisciplinary teaching and research. The fact is that interdisciplinary research will lead to the integration and fusion of knowledge while multidisciplinary research may not. Indian scenario of inculcating research through multidisciplinary approach is one of the key issue for sustaining research in higher education sector. Baldin & Austin (1995) studied that Interdisciplinary research got introduced in Jadavpur University in Kolkota where programs of teaching and research were offered. In 2007, DST Centre for Interdisciplinary Mathematical sciences was introduced with the co-operation of departments like mathematics, Statistics, Applied mathematics & Computer Science.

Objectives

- To provide a knowledge base of research in science and technology domain

- To Interpret learning through the integration of subject areas.
- To inculcate transfer of learning to solve various problems, thereby reaching at the conclusion.
- To apply science and technology through research in today's world
- To implement various technologies for improving health and well-being of future generations
- To develop interpersonal relationships among learners and researchers in multidisciplinary environment

Teaching and Research in Interdisciplinary Centres

The initiative was taken in 2007 by the Ministry of Science & Technology, Government of India in 2007, the aim of which was to promote interactive research among the life sciences' faculty members in science domain under the Department of Biotechnology in Indian Council of Social science. The role of Research (ICSSR) is to foster research in social sciences discipline in two categories of research projects. First category comprises Major and Minor Research Projects while the second research programs formally named as as Research Projects Responsive and Research Projects Sponsored respectively. Indian Institute of Science promotes interdisciplinary research through specific disciplines of interdisciplinary sciences like Bioengineering, economics, human resource management, data science, Nano device and system, public policy, internet of things, computer system, bioinformatics. In 2013 October, Trans disciplinary Research was established in Jawaharlal Nehru University, the purpose of which was to teaching and research of University for fulfilling the vision of innovation as well as social change, thereby promoting Interdisciplinary research in various disciplines like natural disaster and development, history and philosophy of science, language technology, disaster research etc. The International Society of the Learning Sciences (ISLS) is constituted of various

disciplines of sciences like human Genetics, Molecular Biology, Botany, Department of Biochemistry and School of Biodiversity in collaboration with various institute of sciences like Institute of Environment & Sustainable Development in BHU, Institute of Medical Sciences, Institute of Agriculture Sciences and Indian Institute of Technology (BHU). In Delhi university, Interdisciplinary centers like Centre for Science Education & Communication, Interdisciplinary studies of Mountain and Hill Environment, Centre for Global Studies & FR, Women Studied and Development Centre, B. R. Ambedkar Centre for Biomedical Research were established to enhance research and technology. In this way, above said Interdisciplinary Centres are a key role in promoting teaching and research in science field through fusion of research along with teaching in these Interdisciplinary disciplines in new paradigms of Indian Higher Education.

Multidisciplinary University Establishment

Goldfrab (2008) declared that the major challenge on the way of Government is establishing multidisciplinary University. It is due to the presence of large number of single discipline colleges in India like Education Colleges, Medical Colleges, Engineering Colleges etc. Takahashi et al .(2018) explained that a huge challenge is to convert single discipline college into multidiscipline one that requires the expenditure on the part of educational bodies whether centre or state. The govt. owned as well as private bodies in various states are difficult to convince for adding additional disciplines. Infrastructure as well as additional teacher's recruitment is also mandatory. For that, the expenditure may be definitely high. The cost for infrastructure and recruitment of additional teachers in top 50 National Institution Ranking framework (NIRF) on the basis of Norm Model Multidisciplinary College will exceed Rs 2500 million per college in next 10 years. Numerous Government, Private and Deeemed Universities are single discipline universities. It is also difficult to reconstruct these universities into multidisciplinary ones. In order to have their sustainability, Government should take initiative to add multidisciplinary centres or departments in existing central or state universities. The concept of multidisciplinary research will bring into its existence only if the initiatives will be promoted.

High Quality Teaching and Research:

India's higher education system is one of the significant platform in the way of education dissemination to learners and researchers. It is the third largest higher education system in the world, providing education to 30 million students. It has a small number of highly selective institutions, well established in their reputation for producing high-quality graduates. On the guidelines of Yash Pal Committee recommendations, Government did not take any action regarding establishment of multidisciplinary universities. Yet, the modern Information Technology Industry was established due to human resource base. .A number of foreign cooperate Research & development were established countrywide, thereby resulting in economic boom for the country. Janssen & Goldsworthy (1997) found that India's higher education system is one of the most complex higher education systems in the world having 700 universities and more than 36,000 colleges, out of which are private and/or affiliated to universities. Stolkols et al. (2008) found that research teams have been developed for address some

sensitive issues in various fields pertaining to health, education and medicine. In accordance with the stated objectives, the above said disciplines have the ability to provide better results than other ones. In the historic university model, team-based research emerged as a new approach as multidisciplinary research based on independent thinking and research within specific disciplines. Alvargonzález (2011) studied that Team-based research has got privilege of the indifferent research. The role of multidisciplinary universities and colleges will not be far away as they enhance multidisciplinary research at graduate, master's as well as doctoral education. It will enhance the quality of teaching and research achieving holistic education and achieving holistic education. Teaching pedagogy will result in increasing focus on discussion, debate, communication, research and providing opportunities for interdisciplinary as well as cross-disciplinary thinking.

Sustainable Multidisciplinary Research through Team Research

Collin (2009) analyzed that for multidisciplinary research and extension teamwork at the higher education, a proposed framework institution considering the professional needs of the learners included in the team is essential for forth seeing the impact of the team work done on a particular formal society as a whole. In order to attain objectives at desired level, the institution should collectively act for encouraging such work supporting the individuals as professionals within their own discipline. Cooperation will be required for sustaining in the period by the institution on a number of levels. SWOT should be developed for addressing these issues to Weaknesses, Opportunities, and Threats) to compile a perspective of the challenges and opportunities for utilizing multidisciplinary teams to achieve research at a large scale.

The example of conceptualization of a multidisciplinary system has emerged in the field of sciences, in the practice of renewable energy resource. REN21 (2017) explained that the energy sources for electricity generation the example has been .emerged globally. The account is that due to various problems are associated with the traditional fossil fuels, as well as enhancing trends in consumption of .global energy, Renewable energy research has been taken along the field where collaborative research is priortized for facilitating the change. The studies also indicated that established paradigms function well with the established fields of research functioning. Consequently, these try to be more beneficial to collaborative research as compared to emergent fields.

Multi- disciplinarity (MDR) in Research

Bruce & others (2004). provided country-based research and citation rankings list from an open access resource of research and citation metrics, SCImago the basis of which is Scopus, a product of Elsevier. Hall (2011) instructed after analyzing on tourism research that that the serious alter-the indicator highlights a number of flaws in the university rankings based on Impact factor, a well-established journal. The reason lies in the fact due that it is open-access nature, provides a larger source database, thereby assessing the quality of citations. SCImago pertains to the problems of nomenclature, multiple affiliations, and of bias towards large

public-funded research. SCImago database is best known for Journals Rankings and Institutional Rankings and is widely accepted one Choi & Pak (2006) found the priority areas in research analysis as Nanotechnology based implants and regeneration, Machine Learning, Internet of things, multi- modality platforms for enhancing sensory abilities leads to improve human health as well as physical abilities. In this way, nanotechnology will be a fruitful result for revolutionizing new products and services using integration of four technologies. To meet the challenge of integrating technologies, a way for radical change results in scientific innovations together on one platform for fruitful and recognizing research of India.

Conclusion

Multidisciplinary research aims at establishing a coherent picture of integration of science and technology including interdisciplinary workshops, conferences, journals and formal presentations on research in cooperation with the professional bodies. To meet the challenges of enhancing research in science and technology in this era, technical language of various disciplines of science and technology should be developed. In order to sustain the development of science and technology, research should be priority, The Government should taken initiative in this context by adding multidisciplinary research, an integral part of higher education sector, where new concepts and new curricula will be framed and implemented for future of researchers as well as learners. Beyond the 20 years time-span, this kind of research may have significant impact on work efficiency of learners, improving communication ability and mental health, providing the instructors as well as researchers the sustainable environment and transform the culture of theirs, thereby proving the degree of innovation and effort teachers and administrators exercised in themselves in the field of research globally.

Future Scope

The study findings help the educators, policy-makers as well as administrators in

- Students and researchers will be attaining the degree of innovation through efforts done by teachers and administrators in designing/re-designing of school subjects.
- Learning of students will be encouraged through various science concepts, mathematical formulae and technological applicants.
- Integration of Research in various domains will be able to develop a common curriculum for the various subjects of science and technology, thereby making researchers participate in in-depth learning beyond the classroom.
- The country will be at the progress path through performing better results in research and innovations whether in medical stream, Engineering field, arts domain or any other sector like health and nutrition, agriculture etc.

- Nanotechnology, Sustainable Team Research and citations in high- indexed Journals in Web of Science, Scopus, SCI provide the researchers to accomplish their goals sustainable goals.
- Multidisciplinary Projects at each level primary, secondary or tertiary prove to be fruitful for future scientists to make India developed country.

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