



Inquiry-based science education in India: prospects and challenges

DR GARIMA BANSAL DISCUSSES THE HISTORICAL DEVELOPMENT OF SCIENCE EDUCATION IN INDIA, THE EMERGENCE OF INQUIRY-BASED EDUCATION, THE CURRENT STATE OF SCIENCE EDUCATION AT THE SCHOOL LEVEL, AND THE ROLE OF SCHOOL LEADERS IN MAKING INQUIRY-BASED LEARNING A REALITY.

As Agarkar highlights in his 2017 study, there has been a constant thrust on the inculcation of scientific attitude and a spirit of inquiry in the country's populace post-independence. He observed that several national policies have consistently focussed upon the development of scientific temper among the masses, looking at it as a means to eradicate obscurantism and superstition. For example, India's Scientific Policy Resolution (SPR 1958) committed to foster scientific research in all aspects of development. The National Policy on Education first formulated in 1968, and the second one in 1986 and later modified in 1992, recognised science education as a precondition for making developmental progress. Other policies including the Science, Technology and Innovation Policy 2013 have acknowledged science, technology, and innovation as drivers that have the potential to accelerate India's sustainable and inclusive growth. In addition, the recently launched National Education Policy 2020 has once again urged to implement inquiry-oriented pedagogy in classrooms.

The Indian government has initiated several science and technology programmes to foster scientific inquiry among school students. Sharma and Yarlagadda while examining Science, Technology, Engineering, and Mathematics (STEM) policies in 2018 have identified a number of government initiatives that aim to facilitate scientific inquiry:

- Science Exhibition by the National Council of Educational Research and Training (NCERT) started in 1971
- National Children's Science Congress (NCSC) by the Department of Science and Technology (DST) started in 1993
- Initiative for Research and Innovation in Science (IRIS) launched in 2006 – a public-private partnership initiated by Intel Technology India Private Ltd (Intel) and DST
- Innovation in Science Pursuit for

Inspired Research (INSPIRE) launched by DST in 2008 inviting young talent to join science-related careers

■ Atal Tinkering Laboratories designed to provide a workspace with equipment and tools where young minds (years 6-10) can engage in hands-on scientific experiments to develop a deeper understanding of STEM concepts.

Other than government initiatives, the country has witnessed concerted efforts from several non-governmental and non-profit organisations in this direction. People's Science Movement (PSM) that desired to disseminate science among the masses as a means for social transformation was initiated in the country by professionals from different fields in the early 1970s. A large number of organisations emerged since then, such as *Bharatiya Gyan Vigyan Samiti*, *Jana Vignana Vedika*, Delhi Science Forum, and *Eklavya* among others that relentlessly worked towards spreading a spirit of inquiry among the masses (for details, see Sahoo & Pattnaik, 2012). Teachers were supported with inquiry-oriented science textbooks, training, and other resource materials to initiate inquiry-oriented teaching in their classrooms. A few of these initiatives are running successfully to date, for example, *Eklavya*. Unsurprisingly, not all initiatives could sustain. In 2019, Koul, Verma & Nargund-Joshi identified some active non-government organisations committed to the cause: Science Society of India, the International Movement for Leisure Activities in Science and Technology (MILSET), and Connected Learning Initiative (CLIX).

Despite these efforts by government and non-governmental sectors that aim to infuse a spirit of inquiry among India's populace, published research suggests that newly inducted teachers often fail to conduct inquiry-oriented lessons in their science classrooms. Bansal while studying pre-service teachers' conceptualisation and enactment of inquiry-based science

education in Indian primary schools in 2021 has found that despite pedagogical support provided by mentor teachers during field internship of pre-service education, newly inducted teachers find it difficult to design and implement inquiry-oriented lessons in real classrooms. The reasons for that range from a lack of high-quality pedagogical training in pre-service teacher education programmes to institutional constraints placed on teachers by schools. School administration, in-service teachers, and students are reluctant to work on developing scientific inquiry and perceive it as a non-academic endeavour that will not lead to success in high-stakes summative assessments. Furthermore, the ways in which pre-service teachers implemented inquiry-based teaching in their classrooms lacked coherence. They were found to be lacking skills for utilising available resources for inquiry, conducting group work, and orchestrating dialogic conversations which are at the heart of scientific inquiry. All the more, their belief system rooted in didactic teaching prevented them from translating skills learnt in methods course in teacher preparation program into classroom practice.

Therefore, it emerges that though education policies recognise the importance of inquiry-oriented science education, education of science in schools continues to be transacted in a didactic manner. Overhauling teacher education programmes and building schools' and public trust in inquiry-oriented science teaching are essential prerequisites for earning the benefits of inquiry-oriented science. At the moment, an important step in this direction would be to invest in inquiry-oriented science teacher professional development at the in-service stage. If teachers develop the necessary skills in planning innovative lesson plans, they will be able to guide students appropriately. Further, school leaders need to understand that investing in inquiry-based science education requires appropriate changes in teacher and student

timetable, provision of resources, and continuous support to teachers. To begin with, initiatives such as science fairs for students are acceptable ways to engage students in inquiry-oriented science. Also, teachers should be awarded for successfully executing high-quality inquiry-based science lessons in their classrooms. Such activities would foster a culture of inquiry in schools which is essential for witnessing a sustainable change in this direction. **T**

Please refer to the ACER India website <https://www.acer.org/in/professional-learning> to learn more about ACER's professional learning programmes in science and other subjects for in-service teachers.



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