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STRC NEWSLETTER

Science & Technology Resource Centre Gondwana University, Gadchiroli

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From the CPO's Desk

Science Education in Tribal Belts:

Challenges, Innovations, and Experiential Learning Models

Shri Swapnil Girade
Chief Program Officer and Head, STRC

Science education remains a foundational pillar of national development, yet millions of children in India's tribal belts lack meaningful access to quality science learning. Tribal communities, constituting 8.6 percent of the national population and dispersed across geographically isolated regions, face not merely physical access barriers but deeper epistemic challenges: conventional science curricula designed for urban, literate, Hindi or English-medium households produce alienation rather than learning when applied without contextual adaptation to communities with distinct knowledge systems and sophisticated ecological relationships. The UDISE+ 2024-25 report documents this crisis starkly, showing that while tribal elementary enrolment reaches 99 percent, it collapses to 81.3 percent at secondary level and 51.9 percent at higher secondary level, with science attrition even sharper due to dependence on laboratory infrastructure and qualified teachers absent in most tribal schools. Recognising that the challenge extends beyond access to the fundamental misalignment between curriculum.

The Weight of Structural Barriers

Structural barriers preventing tribal student engagement with science education are interconnected and mutually reinforcing: the NHRC's 2024 report identifies absent laboratory infrastructure, chronic teacher shortages, and lack of computer education as critical deficiencies reducing science to rote memorisation, while predominantly non-tribal teachers introduce language barriers and cultural distance, and teacher training has failed to equip educators with culturally responsive pedagogy despite communities' own ecological and medicinal knowledge constituting a rich parallel curriculum. Compounding these institutional failures is an underestimated economic reality in which tribal children enter school speaking first languages unrelated to the medium of instruction, deepening disorientation when science layered with technical Hindi or English terminology speaks past rather than to them, while simultaneous dependence on forest-based and seasonal livelihoods pulls students out at precisely the junctures where science demands sustained engagement. When poverty, early marriage, and competing household demands reinforce this pattern, particularly for girls, while curricula fail to reflect cultural reality, disengagement becomes not an individual failure but a structurally inevitable outcome.

Innovations Reframing the Possible

Recognition that conventional science pedagogy is insufficient for tribal contexts has produced compelling innovations, with multiple models confirming that science redesigned around accessibility, cultural relevance, and experiential engagement generates both curiosity and persistence among tribal learners. Initiatives like, Project Vigyan's Mobile Science Laboratory a purpose-equipped minibus carrying apparatus for 80 experiments across multiple Ashram schools, reaching wider group of students, sparking interest beyond standard curriculum into astronomy, robotics, and climate science while rebuilding institutional trust in the places historically marked by administrative distance. Complementary models, including university-facilitated science camps in Wayanad and ethnopedagogical practices among Warli and Chuktia Bhunjia communities, confirm that embedding indigenous knowledge into instruction deepens student engagement, strengthens community pride, and transforms school-community relationships in ways neither system achieves independently. These innovations share a unifying architecture: they begin with what tribal communities already know and build outward into formal scientific domains rather than imposing curricula disconnected from learner experience.

Gadchiroli: A District That Tests Every Assumption

Gadchiroli concentrates every structural challenge into a single geography, with a literacy rate of 74.4 percent, an urban population of just 11 percent, and nearly 38 percent of residents belonging to Particularly Vulnerable Tribal Groups, primarily the Madia and Gond communities, while the PARAKH Rastriya Sarvekshan 2024 report documents Scheduled Tribe students performing at 60 percent in Language and 53 percent in Mathematics at foundation stage, below state and national averages. The district's landscape is actively evolving through the School Transformation Project, which has delivered smart classrooms, science laboratories, and teacher training across 125 schools through four phases, with 50 additional schools in the current phase covering June 2025 to November 2026, yet infrastructure alone cannot resolve the pedagogical and cultural dimensions of the challenge, as newly equipped laboratories require teachers trained in culturally responsive pedagogy, curricula integrating indigenous knowledge, and sustained community partnerships to generate meaningful and lasting learning outcomes.

The Path Forward

Effective science education in tribal belts must be experiential, culturally anchored, livelihood-relevant, and community-delivered, and the evidence reviewed in this article confirms that models built on these principles consistently outperform conventional approaches in reaching and retaining tribal learners. STRC at Gondwana University operationalises all four principles through its programs, field networks, applied research partnerships, and technical consultancy work, offering a viable and replicable framework that stakeholders must now act on: government education departments should integrate STRC's curriculum frameworks into Ashram and residential school programs, district administrations should formalise teacher training partnerships, academic institutions should co-develop ethnoscience research, and funding agencies should support the scaling of community-embedded delivery models. The tribal child who identifies a hundred forest species, reads seasonal ecological cues, and applies precision knowledge to forest-based production does not lack scientific aptitude; that child lacks an education system that recognises what they already know, and STRC exists to build that bridge.

Article

Bamboo Craft in Gadchiroli:

Structural Constraints, Livelihood Realities, and Pathways to Sustainable Enterprise

Ms. Priyank Kale
Scientific Officer, STRC

Bamboo craftsmanship remains a foundational livelihood tradition among the rural and tribal communities of Gadchiroli district, Maharashtra, yet the artisans who sustain this centuries-old occupation face a set of interlocking constraints that extend well beyond the mere availability of raw material. An empirical study conducted across the Dhanora, Gadchiroli, and Kurkheda blocks, encompassing 90 bamboo artisans selected from areas of comparatively higher craft concentration, reveals not simply a skills gap but a deeper structural misalignment between traditional production systems and the demands of a modern, competitive market one in which 75.56 % of artisans are landless and therefore wholly dependent on non-agricultural livelihoods, 72.22 % have never attended a formal training programme, and nearly half report annual incomes between ₹50,000 and ₹75,000, figures that together paint a portrait of a workforce rich in inherited skill but structurally excluded from the institutional supports that would allow that skill to translate into economic security.

The Key Constraints

The constraints reported by bamboo artisans are interconnected and mutually reinforcing rather than isolated deficiencies: raw-material scarcity, cited by 81.11% of respondents as the foremost challenge, directly compromises production capacity for artisans with little capacity to stockpile material in advance, while the drudgery inherent in manual processing cutting, splitting, slivering, bending, weaving, and finishing reported by 77.78 % renders the craft physically punishing and time-intensive in ways that discourage younger generations from continuing it. Compounding these production-side constraints is an equally severe market-access problem, with 74.44 % of artisans reporting the absence of suitable outlets for their products and 67.78 % citing diminished demand as cheap, mass-manufactured plastic and metal substitutes erode the market for handmade bamboo goods; when 66.67 % remain unaware of available training programmes and 61.11 % lack knowledge of technologies that could ease their labour, and when 55.56% report that their products fail to command a satisfactory price owing to inadequate branding and packaging, disengagement from the craft becomes not a matter of individual capability but a structurally predictable outcome of a value chain broken at nearly every link.

From Traditional Craft to Sustainable Enterprise

The situation of Gadchiroli's bamboo artisans is best understood as a transition challenge rather

than a skills deficit: an artisan may possess considerable proficiency in weaving and processing yet still be unable to fulfil a large institutional order when raw material is scarce, manual methods cap productivity, suitable markets are absent, and even a completed order may fail to realise its full value in the absence of branding, packaging, and market linkages. This case illustrates that improving artisan livelihoods demands an integrated intervention spanning raw-material security, appropriate technology, structured training, product development, and institutional market connections no single intervention, applied in isolation, can resolve a challenge that is systemic in nature.

The Path Forward

Addressing these constraints requires interventions that strengthen the complete bamboo value chain rather than any single node within it: ensuring reliable access to raw bamboo must be treated as a foundational priority, appropriate tools and technologies should be introduced to reduce drudgery without displacing the traditional character of the craft, training programmes must be paired with active awareness and mobilisation efforts so that artisans can actually participate in them, and stronger market linkages through exhibitions, institutional procurement, retail outlets, e-commerce, and digital marketing must be cultivated to connect artisans with customer bases beyond their immediate localities. The bamboo artisan who has inherited generations of technical mastery does not lack skill; what is absent is an ecosystem of raw-material security, technological access, training infrastructure, and market linkage capable of converting that inherited skill into a sustainable and dignified livelihood, and it is precisely this ecosystem that coordinated intervention must now build.

Cover Story

STRC, Gondwana University, Organises Second 'Chaupal' at Yerandi, Kurkheda, in Collaboration with Development Commissioner (Handicrafts), Ministry of Textiles

Yerandi, Kurkheda | July 15, 2026

Science and Technology Resource Centre (STRC), Gondwana University, Gadchiroli, in collaboration with the Office of the Development Commissioner (Handicrafts), Ministry of Textiles, Government of India, and Srushti Foundation, Gadchiroli, organised the second Chaupal programme at Yerandi, Kurkheda, on 15 July 2026. The initiative aimed to facilitate Artisan Card registration and create awareness about government schemes for artisans including financial assistance schemes and entrepreneurship support schemes.

The programme was inaugurated by Shri Vaibhav Ambekar, Naib Tehsildar, Kurkheda, in the presence of Shri Avdhesh Thakur, Additional Director, Shri Dilip Kumar, Handicrafts Promotion Officer, Office of the Development Commissioner (Handicrafts), Shri Swapnil Girade, Chief Programme Officer and Head, STRC, along with officials from various departments, artisans from Kurkheda, Wadsa and Korchi.

During the programme, participants were introduced to benefits of the Artisan Card, Pradhan Mantri Mudra Yojana (PMMY), and other welfare schemes of the Development Commissioner

(Handicrafts). Experts also conducted an interactive session addressing participants' queries related to financial assistance, skill development, entrepreneurship, and market linkages.

A total of 85 artisans participated in the programme. Preliminary Artisan Card registration was facilitated through document collection and verification, enabling eligible artisans to move forward in obtaining official artisan recognition and access to government support programmes, skill development initiatives, and wider market opportunities.

Addressing the gathering, Shri Vaibhav Ambekar encouraged artisans to make effective use of government schemes to strengthen their livelihoods and promote self-reliance. Shri Avdhesh Thakur highlighted the importance of the Artisan Card in improving access to institutional support, financial assistance, and market opportunities. The programme was successfully coordinated with the support of Shri Keshav Gurnule, Director, Srushti Foundation, Gadchiroli.

The Chaupal programme reflects STRC's continued commitment to strengthening the rural artisan ecosystem by facilitating access to government services, promoting entrepreneurship, and fostering sustainable livelihood development through inter-institutional collaboration.

What's Making News

STRC Marks National Fish Farmers' Day with Capacity Building Programme on Scientific Aquaculture at Chamorshi

Srinivaspur, Chamorshi | July 10, 2026

Science and Technology Resource Centre (STRC), Gondwana University, Gadchiroli, organised a one-day Capacity Building Programme on Scientific Fish Farming at Srinivaspur, Chamorshi, on 10th July 2026 to commemorate National Fish Farmers' Day. The programme aimed to enhance farmers' knowledge of scientific aquaculture practices, sustainable fish production, quality fish seed production, and government initiatives supporting the fisheries sector.

The training brought together fish farmers from Srinivaspur and neighbouring villages. Technical sessions were delivered by experts from STRC's Aquaculture and Livelihoods domain, along with resource persons from Jaljeevika, covering pond structuring and management, balanced feeding practices, disease prevention, modern aquaculture technologies, broodstock and hatchery management, and strategies for improving fish productivity.

Participants were also sensitised to government for aquaculture schemes, entrepreneurship opportunities, and value addition in fisheries. A dedicated session showcased the potential of solar drying technology for improving product quality, extending shelf life, reducing post-harvest losses, and enhancing the market value of fish products.

The programme concluded with an interactive discussion in which participants received practical guidance on addressing field-level challenges in fish farming. The training strengthened farmers' technical knowledge, encouraged the adoption of improved aquaculture practices, and promoted value addition and institutional convergence for sustainable fisheries-based livelihoods.

STRC, Gondwana University and Eklavya Foundation Explores Collaboration to Advance STEM Education in Gadchiroli

Gadchiroli | July, 17 2026

Science and Technology Resource Centre (STRC), Gondwana University, Gadchiroli, held a meeting with Eklavya Foundation, Bhopal, on 17 July 2026 to explore opportunities for collaboration in strengthening science and STEM (Science, Technology, Engineering and Mathematics) education. The meeting marked the first formal interaction between the two institutions, providing an opportunity to exchange information on their respective mandates, programmes, and approaches to science education.

The discussions focused on developing experiential, activity-based, and curriculum-aligned learning opportunities for school students in Gadchiroli district. Both organisations also explored potential areas of collaboration, including teacher capacity building, development of educational learning resources, science workshops, training programmes, and science festivals.

The meeting further examined ways to integrate STEM-based learning approaches with STRC's environmental education initiatives and promote innovative school-level science activities through active participation of teachers and students.

The meeting concluded with a mutual understanding to identify priority areas for collaboration, prepare a joint action plan, and initiate pilot activities through continued institutional coordination. The proposed partnership is expected to strengthen science education by promoting experiential learning and enhancing scientific temper among school students in the region.

Mapping of STEM Modules from the Curriculum to Strengthen Science Education in Gadchiroli

Gadchiroli | July 2026

Science and Technology Resource Centre (STRC), Gondwana University, Gadchiroli, has started the mapping of STEM modules and evaluate the current status of science education and support evidence-based planning for STEM TLM's for middle school teachers. The survey primarily focuses on students of Grades VII to IX and aims to identify existing strengths, learning gaps, and capacity-building requirements across schools.

The assessment is being conducted at three levels—school, teacher, and

student. At the school level, it examines infrastructure, science laboratory facilities, digital resources, and institutional support for science education. The teacher assessment focuses on classroom practices, activity-based learning, professional development needs, and challenges in science teaching. The student survey explores interest in science, classroom experiences, opportunities for hands-on learning, scientific thinking, and future educational aspirations.

The findings will provide a baseline for planning future STEM initiatives, including teacher capacity-building programmes, strengthening science laboratories, developing experiential learning modules, organising district-level science festivals, and promoting astronomy and biodiversity education. The assessment will also support the preparation of project proposals and partnerships for advancing science education in the district.

Through this initiative, STRC seeks to promote data-driven planning and develop STEM programmes that address the identified needs of schools, teachers, and students, thereby strengthening the science education ecosystem in Gadchiroli.

EES Phase II Promotes Hands-on Soil Science Learning in Tribal Schools

Gadchiroli | July 2026

As part of the Environmental Education Programme for Tribal School Children – Phase II (EES Phase II), STRC, conducted the "Soil and Us" module across four partnered schools during July 2026. Designed as a three-hour experiential learning session, the module encouraged students to explore the relationship between soil, agriculture, biodiversity, and human life through observation, experimentation, and inquiry-based learning.

During the sessions, students collected and examined soil samples, compared variations in soil texture and colour, learned the basic principles of acids and bases through simple experiments, and carried out introductory tests to understand the presence of iron in soil. Working in groups, they recorded observations, interpreted results, and related scientific concepts to their local environment.

The activity based sessions strengthened students' skills in scientific observation, experimentation, teamwork, and critical thinking while fostering a deeper appreciation of soil as a vital natural resource. By connecting classroom concepts with real-world experiences, the module made science learning more engaging, relevant, and meaningful for rural and tribal students.

STRC Undertakes Assessment of Traditional Fishing Practices, Technologies and Trainings Needs in Gadchiroli Block

Gadchiroli | July 2026

STRC has begun the assessment of traditional fishing technology and training needs to document indigenous fishing knowledge and practices and identify the capacity-building and technology requirements of fishing communities across Gadchiroli district.

As part of the assessment, STRC is undertaking field surveys to document traditional fishing gears, locally used terminology, materials, methods of operation, target fish species, and seasonal fishing practices. The study also records indigenous knowledge passed down through generations and assesses the tools, technologies, and practices currently in use, along with the operational and livelihood challenges faced by fishing communities.

The findings will provide a scientific basis for developing need-based training programmes, promoting appropriate technology interventions, and designing sustainable livelihood initiatives tailored to local requirements. The assessment is also expected to contribute to the documentation and preservation of traditional fisheries knowledge while supporting biodiversity conservation and the sustainable management of aquatic resources in the region.

Gondwana Craft Products Gain International Recognition at BRICS India 2026

Nagpur | 8–12 July 2026

Gifting from the rich cultural landscape of Gadchiroli, handcrafted bamboo bouquets and Gond painting gift sets created by tribal artisans under STRC's Gondwana Craft initiative were presented as welcome gifts to international delegates at the BRICS India 2026 Transport Ministers' Meeting and Senior Officials' Working Group in Nagpur.Crafted by artisans from Gadchiroli, these products showcased the region's rich traditional craftsmanship while offering an eco-friendly and culturally meaningful alternative to conventional official gifts at a major international event.The BRICS India 2026 platform provided valuable national and international exposure for Gadchiroli's indigenous crafts and artisan communities. This participation reflects STRC's commitment to promoting traditional skills through product development, institutional market linkages, and sustainable livelihoods, positioning the region's craft heritage on a global platform.

Our Latest Publications

Monthly Newsletters

STRC Annual Report
2024-25

Techno-Social Tapestry
By Shri Ashis Gharai,
Former CPO & Head, STRC

- Executive Editor -

Shri Swapnil Girade

Chief Program Officer and Head, STRC

- Graphics and Design -

Ms Priyanka Durge

Scientific Officer, Communication for Development through ICT, STRC

- Contribution -

Team STRC

Science & Technology Resource Centre
Gondwana University, Gadchiroli

Conceived and funded by Rajiv Gandhi Science and Technology Commission (RGSTC), Mumbai, Government of Maharashtra, Science & Technology Resource Centre (STRC) is an autonomous institute established in concurrence with Gondwana University, Gadchiroli in 2014. As a centre of excellence for sustainable value creation, STRC is leveraging local resources, relevant knowledge and appropriate technologies for human capacity development. STRC acts as a catalyst to science and technology based development of the under-served tribal communities of the Gadchiroli region and as a bridge between knowledge activities of the University and enhanced livelihoods in the neighborhood.

'Science & Technology Resource Centre Foundation Gadchiroli', registered under the Societies Registration Act, 1860 (XXI of 1860).

www.strc.org.in | strc.gug@gmail.com | +91 7588762147

STRC, Gondwana University, MIDC Road, Complex, Gadchiroli - 442605