



# शोध भूमि

शिक्षा एवं शिक्षण शास्त्र विषय की पूर्व समीक्षित शोध पत्रिका

## Traditional Knowledge Based STEAM Education: Challenges and Opportunities for the future

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### Abstract

STEAM education fosters creativity, critical thinking, and problem-solving abilities in children, it has become increasingly popular throughout the world. It has been particularly beneficial in helping students in industrialised nations to acquire the skills necessary for the twenty-first century. Despite initiatives to enhance educational possibilities, tribal areas which are home to numerous tribal populations with their unique languages, cultural identities, and traditional knowledge systems face substantial obstacles in delivering high-quality education in their schools. The primary issue in these regions is Naxalite activity, which restricts access to essential supplies. This paper reviews relevant research literature to identify several characteristics that promote traditional knowledge-based STEAM teaching. It also identifies future research opportunities and problems associated with STEAM education. In tribal communities, traditional ecological knowledge, medical expertise and practices, agriculture, food and seed gathering and preservation, artistic and creative expressions, architecture, historical information, astronomy, and other fields hold significant value. Therefore attempts can be taken to give children a high-quality education by designing and implementing STEAM education programs that integrate traditional knowledge into the teaching and learning process. In the face of many obstacles, this might be a better choice to help students stay linked to Indian knowledge and culture while also learning how to address problems in the future.

**Key words:** *Tribal Areas, STEAM Education, Traditional Wisdom.*

**Introduction**

STEAM (Science, Technology, Engineering, Art and Mathematics) education has gained significant popularity globally for its ability to develop creative thinking, problem-solving skills and innovation in students, but successful implementation of STEAM education in a resource-constrained environment, especially in tribal areas, may face many challenges which require careful analysis and understanding. Traditional ecological knowledge, medicinal knowledge and treatment methods, agriculture, food and seed preservation, architecture, artistic and creative expressions, historical knowledge, astronomy etc. have an important place in tribal areas, in such a situation, by incorporating traditional knowledge in the design and implementation of STEAM education programs and integrating it in the process of teaching and learning, we can try to provide quality education to the students, this can be a better option among various challenges so that students will be able to solve the challenges of the future while remaining connected to Indian roots and pride.

**Objective**

To identify opportunities and challenges associated with Traditional Knowledge Based STEAM education.

**Methodology**

In this paper reviews total 18 research papers and relevant research literature, documents to identify several characteristics that promote traditional knowledge-based STEAM teaching and opportunities and problems associated with STEAM education.

**Challenges to Implement Traditional Knowledge-based STEAM Education**

The main challenge for STEM education is quality infrastructure and the funds required to build it (Malti, 2017). Most teachers in developing countries know about STEM, but they do not know how to integrate STEM into the learning process, their understanding of STEM varies (Widya et al., 2019). Complex gaps between the cultural identity, beliefs, teaching practices, and technology competencies of teachers participating in the professional training program (Koul et al., 2020). Women and individuals belonging to historically disadvantaged social groups were found to have very low interest in studying science subjects (Kumar & Sahoo, 2021). Implementing new teaching methods for STEM in rural areas is challenging (Qureshi & Qureshi, 2021). STEAM classes do not provide assessment of projects related to science, technology, engineering, arts and mathematics (Dashdemirov & Sharifov, 2022). Teachers use the school's outdoor spaces only occasionally and this use decreases as the level of the class they teach increases. Outdoor spaces are most often used for physical activities.

Interdisciplinary activities in outdoor spaces are permitted but their implementation is limited, hindered by factors such as the bulk of the curriculum and lack of training for teachers (Correia et al., 2024). Teachers were highly interested in indigenous knowledge but they and the younger teachers working with them did not have sufficient knowledge to incorporate indigenous knowledge systems in their teaching. Other challenges they faced were the time and effort required to acquire subject-related indigenous knowledge from community members. The local knowledge was not well connected to the school subjects they taught. Teachers found that students preferred modernity over indigenous knowledge (O'Donoghue et al., 2024).

### **Opportunities for the Future**

In the context of STEM education, curriculum and pedagogy ensure student engagement by providing inquiry-based, student-centered instruction. Such reforms promote problem-solving, creativity, and reasoning skills essential for innovation in the global economy and can unleash scientific literacy and competence among underrepresented groups, primarily girls and women and indigenous peoples who are geographically isolated (Freeman, 2014). The governments of both the countries Australia and India want to train the young population as a skilled workforce to meet the future demand of the industries (Sharma & Yarlagadda, 2018). In four countries: Australia, India, Indonesia, and the United States of America (USA) STEM is considered extremely important by governments for the country's economic and environmental future (Sheffield et al., 2018). STEM education has a positive effect on the academic achievement of students. STEM related activities help students to learn concepts of subjects such as science, technology, engineering and mathematics and to be more active (Chaudhary, 2020). STEM education can improve the quality of teaching and learning as teachers have a positive attitude towards it (Kratika, 2022). The STEM Autonomous Learning City Map Application has a positive impact on the logical thinking skills of students (Hermita et al., 2023). If traditional knowledge and STEM are integrated, then it can also be helpful in achieving the goal of self-reliant India (Karunamay, 2023). Students who are enrolled in STEM education behave well, are more disciplined and make responsible decisions. The implementation of STEM education in schools improves the learning outcomes of students (Singla, 2023). In United States STEM education program was successful, but there is a need for the involvement of the elite class of the community. In the UK, many teachers were trained and better curriculum content was incorporated as required for STEM education. In Australia, a shortage of scientists and engineers was experienced to overcome this shortage, they formulated STEM policies and programs, some of which were successful and promoted Australian STEM education. STEM

education programs in Japan have been successful in increasing the interest and enrollment of students in the fields of science, technology, engineering and mathematics (Muhammad et al., 2022). In STEAM educational process, theoretical knowledge and practical knowledge are placed on the same level, that is, students acquire knowledge and then learn to use it. In the elementary classes, Compared to other teaching methods, STEAM provides students opportunities to experiment, build models, create music and pictures, and express their ideas (Kizi, 2023).

### **Conclusion**

Thus, from the review of related research literature, few studies was found on opportunities and challenges associated with Traditional Knowledge Based STEAM education, the advantages of traditional knowledge in STEAM courses and the effective implimentation of STEAM education in rural areas. The findings of this study will not only contribute to the existing literature on STEAM education but also provide valuable guidelines for policymakers, educational institutions, and relevant stakeholders to develop specific strategies for the successful implementation of STEAM education in tribal areas. By bridging the educational divide and empowering students in tribal communities with quality STEAM education, we can promote inclusive growth and equal opportunities for their future success in an increasingly technology-driven world.

### **Recommendation**

It is better to start STEAM learning at an early age because students can learn quickly in the first five years. STEAM can be made interesting by teaching through games and various activities. Spreading awareness among the public about the benefits of STEAM. Also, it is necessary to encourage students to do real-life related projects through which they will learn the concepts of science and mathematics through real-life experiences. Equal participation of girls in the process of learning STEAM subjects and reducing the gender gap in STEAM-related subjects is necessary for sustainable development. Girls should be encouraged to learn STEAM subjects from childhood and choose it as a career option in future. For assessment of projects related to science, technology, engineering, arts and mathematics there is a need to structure STEAM curriculum to solve these problems in a systematic way. STEAM education guidelines need to be developed for teachers and students. The corporate world needs to cooperate in the field of education. Teachers in many countries need a deeper understanding of STEAM. There is a need to train teachers on the interdisciplinary use of outdoor spaces.

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