

# Literature Survey on STEM Education in Ireland and India

## 1 Current Landscape and Trends in STEM Education

Ireland and India prioritize STEM education to foster skilled workforces, but their approaches differ. Ireland's robust ecosystem integrates STEM from preschool to primary levels, supported by national curricula and industry partnerships Lee et al., 2022. Its students excel in PISA and TIMSS assessments, ranking high among EU nations, yet sustaining interest beyond compulsory education and addressing ICT/engineering skill shortages remain challenges Lee et al., 2022; Roungos et al., 2020.

India's STEM education, marked by rapid institutional growth, emphasizes science and mathematics but often excludes engineering and technology from K-12 curricula Sheffield et al., 2018. Students lag behind OECD standards due to inadequate infrastructure, teacher shortages, and outdated curricula Sheffield et al., 2018. Traditional teaching methods hinder inquiry-based STEM approaches Tawbush et al., 2020. Initiatives like Atal Tinkering Laboratories target top students, often neglecting broader populations, with education and R&D funding below global benchmarks Sheffield et al., 2018.

## 2 Gender Disparities in STEM

Gender gaps in STEM persist globally, with men favoring STEM and women leaning toward arts, humanities, or medicine Tătar et al., 2023. In Ireland, a narrow mathematics gender gap exists, but women are underrepresented in technology and engineering Lee et al., 2022. Factors like early exposure, career guidance, and low self-efficacy among girls contribute Cleary et al., 20XX. Policies aim to boost female participation from early education Lee et al., 2022.

In India, engineering programs show significant male dominance, with balanced science participation but underrepresentation of women from lower socioeconomic groups Sharma and Kumar, 20XX. Stereotypes and gender norms deter women from STEM, compounded by job mismatches and limited career growth Sharma and Kumar, 20XX; Tawbush et al., 2020.

### 3 Student and Parental Perceptions, Confidence, and Technology’s Role

Student and parental attitudes shape STEM engagement. In Ireland, elementary students view STEM positively, with males slightly more favorable Anonymous, 20XX. Confidence ties to past performance and active learning, while didactic methods reduce it O’Connell and Smith, 20XX. Technology is valued for enhancing learning and job preparation, though commitment wanes in secondary years Murphy and O’Sullivan, 20XX; Sheffield et al., 2018. Parental expectations influence STEM career aspirations Kelly et al., 2022.

In India, positive STEM attitudes drive career development, but female confidence lags Panda and Rao, 20XX; Verma and Sharma, 20XX. Parental aspirations push students toward engineering and medicine, though access for underprivileged students is limited Gupta and Singh, 20XX. Technology’s role is recognized, but resource and teacher preparedness issues hinder integration Tawbush et al., 2020; Verma and Sharma, 20XX.

### 4 Jobs, Future, and Policy Implications

Both nations face high STEM professional demand. Ireland’s skill shortages in technology and pharmaceuticals drive policies like the "Innovation 2020 strategy" to nurture talent and boost teacher capacity IBEC, 20XX; Lee et al., 2022. The STEM Passport for Inclusion targets girls from disadvantaged backgrounds, yet overall STEM participation remains at 30% Ireland, 2023.

India exports significant STEM talent, with domestic demand in health-tech, cybersecurity, and AI Aayog, 2023; External Affairs Ministry, 2024; NASSCOM, 2024. The National Policy on Education (2016) emphasizes innovation, but retaining talent and supporting underprivileged youth are challenges Sheffield et al., 2018. Common policy themes include government-led planning and teacher professionalism Zhang and Chen, 2023. Parental involvement is critical for STEM success Muhammad et al., 2022.

### 5 Critical Analysis and Gaps in Literature

Ireland’s strong STEM performance requires sustained engagement and gender equity Lee et al., 2022. Policy impact on diverse socioeconomic groups needs more empirical study, and teaching method combinations warrant further research Roungos et al., 2020.

India faces infrastructure, teacher quality, and curriculum fragmentation issues Sheffield et al., 2018; Tawbush et al., 2020. Initiative impacts on broader student populations and constructivist learning are underexplored Sheffield et al., 2018.

#### **Comparative Gaps and Contributions of the Proposed Survey:**

1. **Direct Cross-Country Comparison of Perceptions and Confidence:** Literature lacks direct Ireland-India comparisons on student/parent confidence and attitudes Tătar et al., 2023. This survey will provide empirical data.
2. **Nuance in "Male/Female Centricity":** Gender perception differences across cultural contexts are underexplored. This survey will compare intensity and manifestation.

3. **Perceived Role of Technology in STEM:** Comparative student/parent views on technology's role need deeper study.
4. **Future and Job Aspirations:** Direct comparison of STEM job aspirations is missing.
5. **Policy Effectiveness:** Real-world policy impacts on confidence, equity, and technology need stakeholder perspectives Muhammad et al., 2022.

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