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BARRIERS TO BREAKTHROUGHS

Encouraging Girls' Participation in STEM Education

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Abbreviations

4IR	:	Fourth Industrial Revolution
AI	:	Artificial Intelligence
AISECT	:	All India Society for Electronics and Computer Technology
AISHE	:	All India Survey on Higher Education
B.Ed	:	Bachelor of Education
CCE	:	Continuous and Comprehensive Evaluation
CEO	:	Chief Executive Officer
CSR	:	Corporate Social Responsibility
DIB	:	Development Impact Bonds
DIKSHA	:	Digital Infrastructure for Knowledge Sharing
DIY	:	Do It Yourself
EVS	:	Environmental Science
FGD	:	Focused Group Discussion
FY	:	Financial Year
ICT	:	Information and Communication Technology
IIIT	:	Indian Institute of Information Technology
IIT	:	Indian Institute of Technology
IoT	:	Internet of Things
ISA	:	Income Sharing Agreement
IT	:	Information Technology
ITI	:	Industrial Training Institute
KGBV	:	Kasturba Gandhi Balika Vidyalayas
NAS	:	National Achievement Survey
NCERT	:	National Council of Educational Research and Training
NCTE	:	National Council for Teacher Education
NEP	:	National Education Policy
NFHS	:	National Family Health Survey
PAL	:	Personalised Adaptive Learning
PG	:	Postgraduate
PTM	:	Parent-Teacher Meetings
RAA	:	Rashtriya Avishkar Abhiyan
SEL	:	Social and Emotional Learning
SKI	:	Sattva Knowledge Institute
SMC	:	School Management Committee
STEM	:	Science, Technology, Engineering and Mathematics
UG	:	Undergraduate
UNESCO	:	United Nations Educational, Scientific and Cultural Organisation
UNICEF	:	United Nations Children's Fund

CONTENTS

Executive Summary

STEM, an acronym for Science, Technology, Engineering, and Mathematics, embodies a holistic approach to education and careers essential in today's interconnected world. Coined by Dr Judith Ramaley in 2001, it emphasises critical thinking and problem-solving applied to real-world situations. While defining STEM at the school level remains challenging, it generally includes natural, physical, and life sciences, technology-related disciplines, engineering, and mathematics.

STEM skills are crucial for problem-solving, innovation, and societal advancement. UNESCO defines STEM competence as applying STEM knowledge, skills, and attitudes appropriately to real-world problems. Key competencies include critical thinking, problem-solving, scientific investigation, computational thinking, design thinking, creativity, innovation, collaboration, and communication.

Achieving gender parity in STEM education is about equitable representation and creating a diverse and inclusive workforce for innovation and societal progress. With 80% of future jobs expected to require STEM skills, India, with 31.7% of global STEM graduates, is a significant player in the STEM job market. As per McKinsey report (Digital India 2019), the digital economy in India will potentially create 60-65 million jobs in India's digital sectors by 2025, necessitating a strong focus on STEM education. However, gender disparity in STEM fields persists, with female enrollment significantly lower in science than in arts-related disciplines. **Bridging this gap is crucial for labour market dynamics and ensuring inclusive and universally beneficial technological solutions by encouraging women's participation in STEM**.

Encouraging trends in girls' STEM education have been observed, with significant year-on-year increases in female enrollment in STEM undergraduate courses. Female enrollment in STEM higher education now stands at 43%. This trend indicates increasing awareness of the importance of STEM courses among girls opting for higher education in India. The government's policy reforms under the National Education Policy (NEP) 2020 and the Central and state governments' several affirmative actions are steps in the right direction to help increase the uptake of science streams among school students.

Despite these, the percentage of girls graduating from science disciplines from higher secondary grades in schools is just 37% in India. However, in states like West Bengal (11%), Punjab (16%), Haryana (13%), Gujarat (16%), Jharkhand (15%), Rajasthan (19%), and Odisha (22%) percentage of girls graduating from science and maths disciplines in higher secondary grades is much lower than the national average. Several socio-economic, regional, cultural, and individual factors contribute to girls' low STEM uptake in these states.

Challenges impeding the uptake of STEM education can be categorised as gender-agnostic, gender-accentuated and gender-specific challenges. Gender-agnostic challenges include inaccessibility of resources, classroom inefficiency, and poor foundational skills,

which affect students regardless of their gender. Gender-accentuated challenges – such as the prohibitive cost of STEM education as compared to other streams, access and mobility issues, and lack of career guidance – originate from financial, geographical, and societal barriers and affect girls disproportionately. Gender-specific challenges unfold in the form of societal norms and institutional biases, presenting unique hurdles for girls and impacting their representation in STEM fields.

The report delves into the complex landscape of interventions attempting to resolve these challenges and address the gender gap in STEM. Solutions to **gender-agnostic challenges promote STEM mindsets in girls and boys through tinkering, hands-on experiences, and exposure visits** by enhancing teacher capacity and access to infrastructure. Initiatives like Atal Tinkering Labs, Tech Mahindra's establishment of STEM labs, and the availability of digital platforms such as DIKSHA exemplify this approach, which improves learning outcomes for both boys and girls. **Solutions** addressing **gender-accentuated challenges** aim to improve girls' access to financial resources, provide unbiased career guidance and foster community-driven access to STEM subjects for girls. Scholarships like CBSE-UDAAN career mentorship programmes offered by Lend A Hand India, Avanti Fellows and NavGurukul, are pivotal in bridging the gender gap, offering girls the financial resources and encouragement needed to pursue STEM education. Solutions addressing **gender-specific** challenges emphasise community engagement, exposure to role models, building agency in girls to navigate gender biases, and combating teacher bias. Initiatives like Naandi foundation's Nanhi Kali project, Ganit Kalika project by Akshara Foundation and Milaan Foundation's Girl icon projects are doing commendable work in shifting community mindsets towards girls' STEM education and career choices.

While individual initiatives have shown promise, the scale and complexity of challenges in a country like India demand collaborative efforts. **The study proposes an ecosystem-centric approach to extend the reach of these solutions and amplify their impact**. This approach requires building a public infrastructure that not only reduces transaction costs, but also focuses on creating gender-intentional solutions. Such a framework leverages the collective strength of various stakeholders, from government schemes to non-profit initiatives and private sector innovation, to ensure a coordinated and impactful response to the gender gap in STEM education. The study takes a 360-degree view by incorporating the voices of over 800 individuals including 40+ expert interviews, 740+ quantitative surveys with girls from grade 9 to 12, eight FGDs with 65 girls, 10 interviews with teachers and industry players and a co-creation workshop with 25+ sectoral experts.

As a way forward, the report proposes four key ecosystem-wide solutions to accelerate action:

1. **Building an open network ecosystem for scholarships and financial support**: Lack of awareness and access to financial resources like scholarships deters girls' future aspirations to study STEM subjects. Hence, an open network ecosystem that can support a gender-specific platform for delivering low-cost loans and scholarships is

recommended. It will enable all key stakeholders, like girls, scholarship providers, and validating organisations, to come together to generate a seamless distribution of even small scholarships by reducing the cost of transactions.

2. **Building a digital public infrastructure (DPI) for career guidance and mentorship**: Lack of awareness of probable STEM careers challenges girls while choosing disciplines in higher secondary grades. An open infrastructure that enables a wide range of stakeholders to enrich content and enable discovery will help students identify local career opportunities and connecting remote/rural region students with mentors and professionals in the STEM field will allow sharing and integrating hyperlocal career opportunities and awareness for girls.

3. **Constructive action with the community on shifting gender norms on STEM**: Research indicates that current community programmes targeting gender norm shifts typically rely on awareness campaigns or limited-scale interventions within specific communities. It is recommended to orchestrate a participatory community movement involving local bodies, empowering girls to showcase their analytical skills and fostering parental belief in girls' STEM capabilities.

4. **Leverage assessments to enable state action in STEM skills for girls**: Several state governments have shown intent towards building life skills among students. However, data-backed evidence must be created to enable these governments to make informed decisions on creating gender-backed curricula for life skills. A large-scale life skills assessment exercise could address this shortcoming.

These ecosystem-wide solutions, informed by the experiences of initiatives across the country, provide a roadmap for coordinated action to ensure that every girl can engage with and excel in STEM education.

01
The Future is STEM

STEM – an acronym representing the disciplines of Science, Technology, Engineering and Mathematics – encapsulates the integrated approach to education and career paths that are pivotal in the modern, interconnected world. The term was coined by Dr Judith Ramaley in the U.S. National Science Foundation in 2001.[1] Since then, the term has grown to symbolise a cohesive learning model that emphasises critical thinking, problem-solving, and the application of knowledge in real-world situations.

Defining STEM at the school level has been challenging for researchers, as schools typically need to adopt an integrated approach to subjects. Marrero Meghan's study highlights this ambiguity: for some, STEM education and careers encompass the hard sciences and mathematics exclusively; for others, the definition broadens to include social sciences and related disciplines. There is consensus, however, about STEM comprising natural, physical and life sciences (including medicine), computer electronics and other technology-related disciplines, all types of engineering, and mathematics, as well as any field involving heavy application of mathematical principles.

STEM education is not merely about acquiring knowledge in a select discipline; it is about developing a comprehensive skill set that prepares individuals to tackle complex problems, innovate, and contribute to society's advancement.

What constitutes STEM skills?

STEM skills include knowledge, attitudes, skills, and values necessary to identify questions and problems in life situations, explain the natural and designed world, and draw evidence-based conclusions about STEM-related issues.

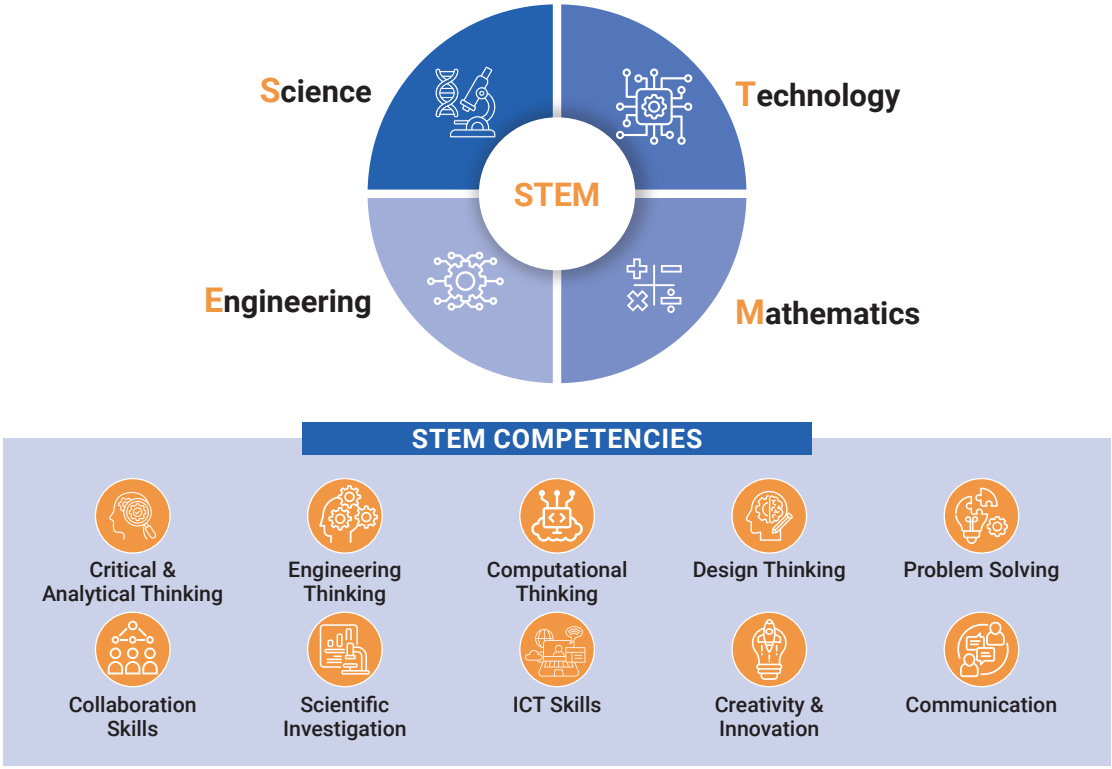
UNESCO defines STEM competence as an individual's ability to apply STEM skills appropriately in their everyday life, workplace, or educational context. STEM competencies include critical and analytical thinking, problem-solving and engineering thinking, scientific investigation, computational thinking and ICT skills, design thinking, creativity, innovation, and collaboration and communication skills.

Opportunities for India

The National Science Foundation has predicted that 80% of the jobs in the coming decade will require some STEM skills.[2] As technological advancements permeate every sector, from agriculture to robotics, the necessity for STEM skills has become universal. This shift underscores the need to cultivate STEM mindsets and capabilities.

India globally accounts for 31.7% of all STEM graduates (students having higher technical education after completing school), positioning itself as a significant player in the world's

Figure 1: UNESCO highlights the 'Essential STEM Skills that will shape our world'



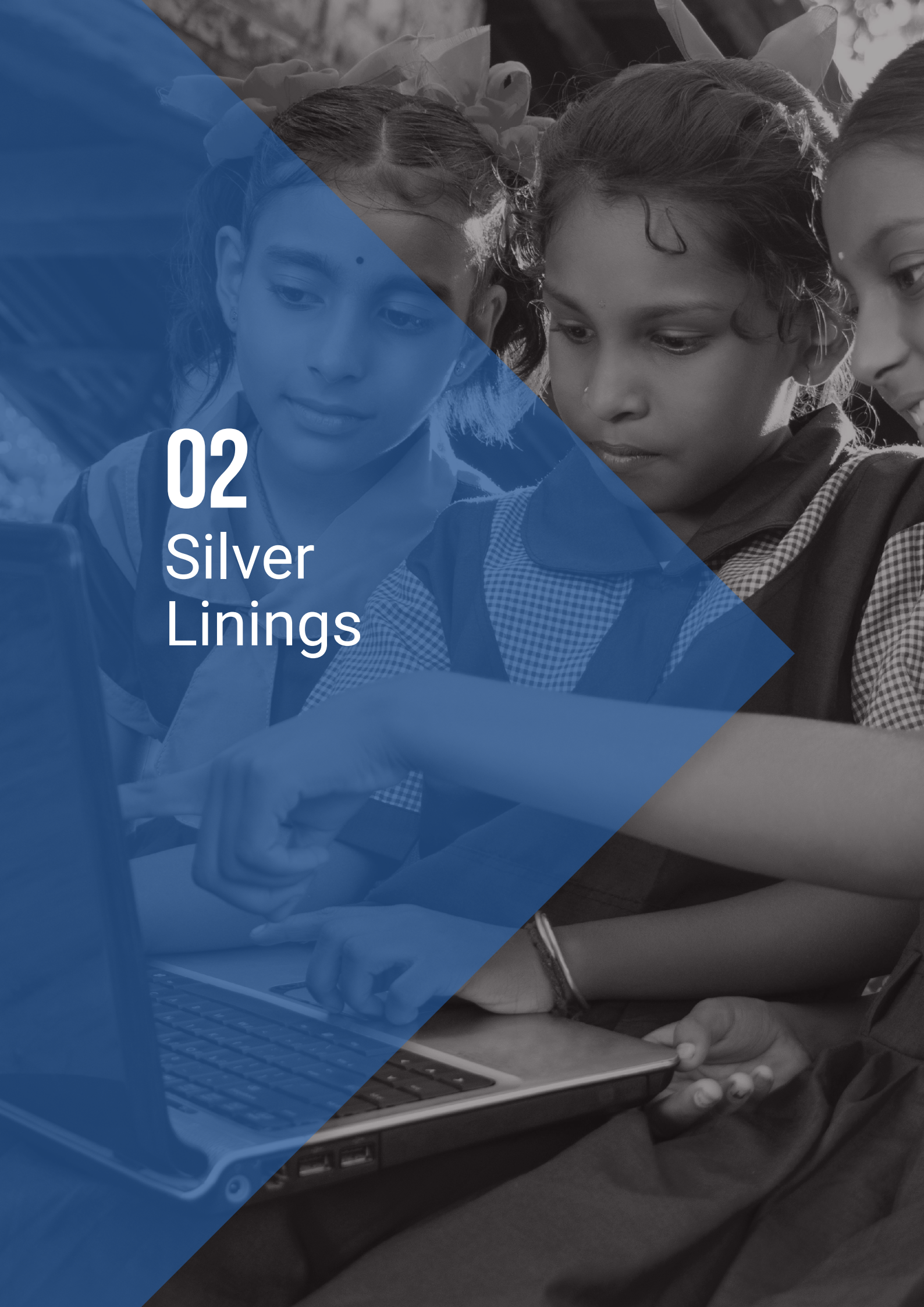
STEM job market. Between 2016 and 2019, there was a substantial 44% increase in STEM-related job roles in India itself, according to Indeed.[3] With the emergence of the Fourth Industrial Revolution (4IR), **nearly 60-65 million jobs are projected to be created in India's core digital sectors by 2025**.[4] These sectors, including information technology, digital communication, cybersecurity, e-commerce, and digital finance, form the backbone of India's developing economy. The growth in these sectors – driven by advancements in areas such as generative artificial intelligence (AI), green jobs, robotics and the Internet of Things (IoT) – indicates a burgeoning demand for STEM skills.

Equity considerations also drive the push for gender parity in STEM education. Historically, a lack of female representation in engineering and technology has led to oversight of women's specific needs. For instance, early voice recognition systems, calibrated predominantly for male voices, failed to recognise female speech effectively.[5] Similarly, the initial design of automotive airbags by male engineers did not adequately account for women's and children's safety, leading to preventable injuries.[6]

The government recognises the importance of futuristic education tailored to meet the evolving demands of the workforce, particularly in STEM fields. Through various initiatives, the Government of India has actively promoted women's participation in STEM education at both school and college levels. Recognising the importance of gender diversity in STEM fields for fostering innovation and economic growth, several schemes and programs have been

implemented to encourage girls to pursue STEM education. At the school level, initiatives such as the Beti Bachao Beti Padhao (Save the Daughter, Educate the Daughter) campaign aim to increase girls' enrollment and retention in schools. Additionally, scholarships and fellowships targeting girls pursuing STEM education help alleviate financial barriers and incentivise academic excellence.

India has historically grappled with low female workforce participation. However, STEM-related jobs offer the potential to change this trend. The role of teachers' guidance and parental encouragement in facilitating girls' involvement in STEM education is critical.[7] Given India's status as the world's youngest country, integrating women into the workforce can significantly contribute to the nation's future.



02
Silver Linings

The fourth Industrial Revolution is characterised by "a range of new technologies that are diluting the boundaries between the physical, digital and biological worlds", and it is critical for the nations to have skilled manpower to harness this revolution.[8] Acknowledging the fact, a series of initiatives have been undertaken at the national and state levels to develop scientific temper in the youth of the country. At the same time, steps have been taken to reduce the bottlenecks impacting the uptake of STEM education. Details of a few of them can be found below.

India has the world's highest number of STEM graduates, and the number of women choosing STEM courses at higher education levels has steadily increased.[9] The Government of India has undertaken numerous initiatives to promote the uptake of STEM education and research within the country. Notably, there has been a rise in female enrollment in STEM courses at the higher education level (college and beyond), climbing from 38.4% in 2014-15 to 42.6% in 2021-22.[10] In a significant stride towards fostering collaboration and resource accessibility within the scientific community, the government has established I-STEM, a central hub to link researchers with essential resources, facilitating seamless knowledge exchange and collaboration across diverse scientific disciplines.

India's commitment to nurturing scientific curiosity is evident through a surge in the interim budget allocations for 2024-25. The Department of School Education & Literacy received the highest-ever budget allocation of ₹73,498 crores for the FY 2024-25, with ₹37,453 crores allocated to Samagra Shiksha. This integrated programme envisages the all-round development of children.[11] The government also announced the establishment of a corpus of 1 lakh crore rupees to provide 50-year interest-free loans to tech-savvy youth.[12]

The National Education Policy (NEP) lays a strong foundation for STEM education. It tasks state governments with ensuring that schools have adequate resources and support systems, including trained teachers, computer labs, and skill labs. It prioritises high-quality bilingual textbooks in science and mathematics, promotes mathematical and computational thinking, and uses innovative teaching methods like games and coding. It promotes the organisation of competitions and games and the showcasing of Indian luminaries. Furthermore, the NEP advocates for supporting students through supplementary materials, project-based clubs, gender-neutral curricula and inclusive learning environments through teacher capacity building.

The Rashtriya Avishkar Abhiyan (RAA) has been initiated under the Samagra Shiksha Scheme as a convergent framework that aims at nurturing a spirit of inquiry and creativity, a love for Science and Mathematics and effective use of technology among children aged 6-18 years.[13] Central to its approach is the mentoring of schools by Higher Education Institutions (HEIs). This facilitates student engagement and fosters a culture of hands-on learning in science and mathematics. RAA emphasises the promotion of teacher circles, children's clubs, participation in olympiads, and teacher capacity building. It advocates for integrating mathematics and computational thinking throughout the curriculum and establishing tinkering labs to encourage creativity and innovation. RAA also promotes student exchange programmes, excursion trips, and exhibitions to enrich the learning experience

and foster a deeper understanding of STEM subjects. Several other central governmental programmes and initiatives promoting scientific education, inspiring innovation, and nurturing young talent are listed in *Annexure B*.

To understand the challenges faced by women in STEM, the three key national science academies: the Indian Academy of Sciences (IASc) Bangalore, the Indian National Science Academy (INSA), Delhi and the National Academy of Sciences India (NASI) Allahabad came together to create the roadmap for women in STEM careers. It restructured all the women-specific programmes under one umbrella, **Women in Science and Engineering - Knowledge Involvement Research Advancement through Nurturing (WISE-KIRAN)**, which aims to address issues related to women scientists such as unemployment, career breaks, relocation, etc, through its various programme strands.[14]

State-level initiatives further amplify the momentum. In Tamil Nadu, 100 mobile labs have been established, and 710 STEM facilitators have been trained under the Vanavil Mandram scheme for students of grades 6 to 8.[15] In Haryana, the 'Main Bhi Curie' programme, a collaborative initiative between SwaTaleem Foundation and the Haryana government, designed to ignite a passion for STEM among girls in Kasturba Gandhi Balika Vidyalaya schools. The curriculum covers 26 themes, and each cycle concludes with a Science Gender Mela, where girls showcase their scientific models in villages and to government officials. In Assam, 1,000 teachers attended a six-day residential training at IIT Guwahati in December 2023 to revamp teaching pedagogy and bring quality STEM education to schools.[16] The Uttar Pradesh government has signed a memorandum of understanding (MoU) with Khan Academy to enhance the maths skills of over five lakh students in 48,000 state-run schools.[17] The Government of Delhi has established Schools of Specialised Excellence for grades 9 to 12 for students to specialise in their chosen fields, including high-end 21st-century skills and STEM.[18] Several such initiatives are being launched at the state level to ensure the youth is prepared to take advantage of economic opportunities opening up due to the 4IR. Interventions by the Government of Andhra Pradesh, with an allocation of 12% in 2022-23 of the total education budget, make it stand out as an exemplary state.

Compared to the national average of 32%, nearly 70% of Andhra Pradesh's girls in higher secondary are enrolled in STEM programmes.[19] The state is distinguished by its policies – providing school kits, need-based aid for students, distributing tablets, installing smartboards, mapping schools to engineering colleges for teacher training and providing IIIT admission for girls based on their grade 10th results. One of the key distinguishing factors enabling girls' uptake of STEM education is the availability of the science discipline in all higher secondary schools in Andhra Pradesh, along with financial support to girls with 75% school attendance.

With increasing female enrolment in STEM fields in higher education, there is a palpable shift towards nurturing scientific curiosity and innovation. Steady progress has been achieved with government interventions focused on prioritising STEM education. The subsequent chapters dive into areas that need attention to ensure sustained growth and women's advancement in STEM education.

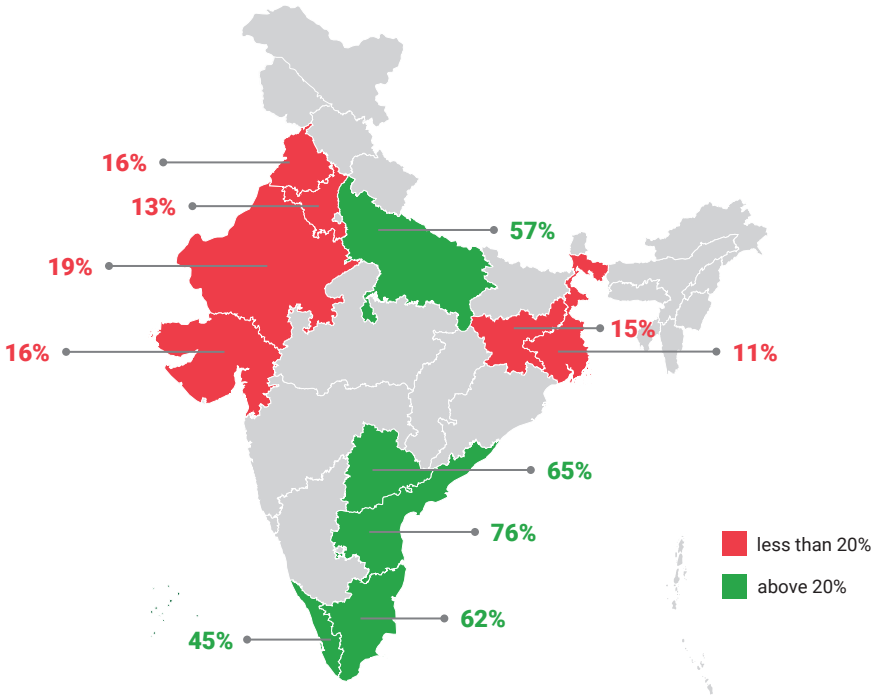
03
The Unaddressed Problem

Despite concerted efforts to promote STEM education and workforce development, several states in India continue to exhibit a preference for non-science subjects at the school level. This contributes to a widening disparity between the country's demand and supply of technically skilled workers. This section explores the underlying factors driving the preference for non-science subjects in the eight states that lie at the bottom regarding girls' uptake of the science streams in school.

The picture is not as rosy in all the states

A deeper analysis of higher secondary education unveils significant disparities in science education among states. On average, only 37% of girls graduate from school in science disciplines, with notable differences observed between South Indian states, and those in Central and North India. For example, West Bengal reports only 11%, followed by Haryana at 13%, Jharkhand at 15%, Gujarat at 16%, Punjab at 16%, Rajasthan at 19%, Odisha at 22%, and Bihar at 29%, marking these as the lowest performers with regard to girls graduating in the science stream.

Figure 2: Several states have less than 20% of girls passing Grade 12th from the science stream

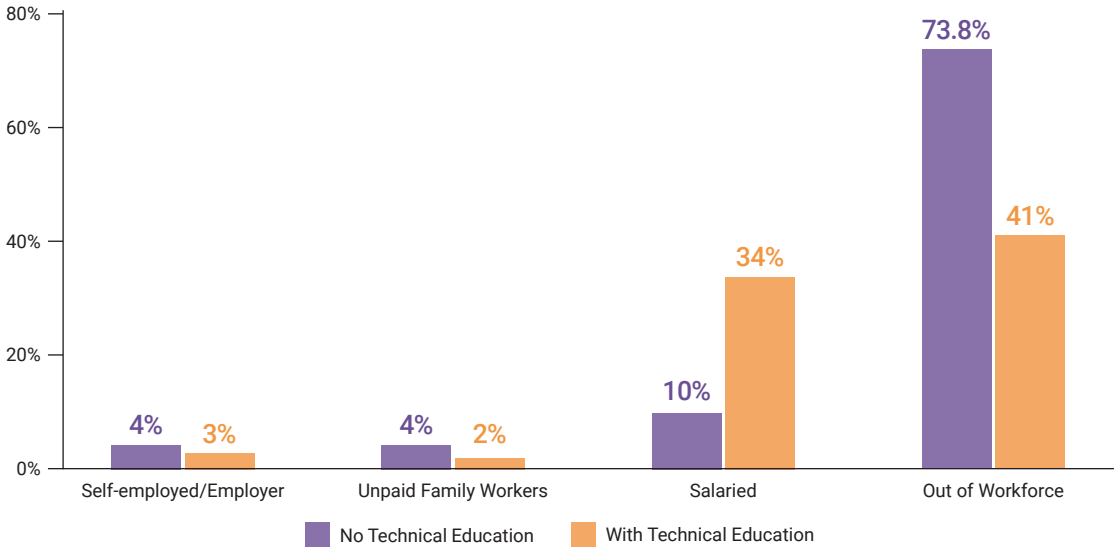


Source: Results of Secondary and Higher Secondary Examinations 2022, Ministry of Education, Department of School Education

Research indicates that studying science in high school leads to 22% higher earnings in later stages than studying business and humanities, even after accounting for various abilities. Women with technical education backgrounds are more likely to participate in the workforce and, simultaneously, transition from casual labour status to salaried employment.

Given the anticipated demand for STEM skills in future jobs, schools must cultivate these skills starting from primary grades to attract more students to the science stream in higher secondary

Figure 3 : Women with Technical Education have Higher Probability of Being in the Workforce with Salaried Employment



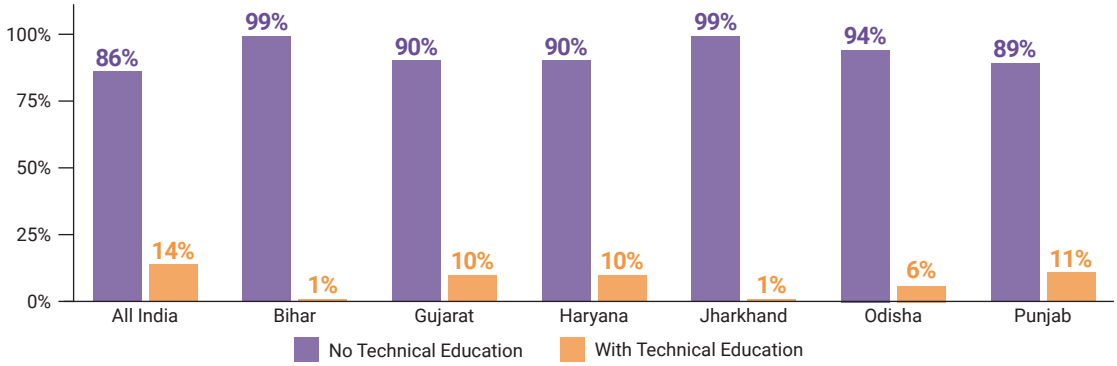
Source: Sattva analysis of unit level PLFS 2022-23 data for women in the 22-30 years of age group with at least higher secondary education.

grades. The Indian education system allows students to choose science subjects in Grade 11. Only these students are eligible for STEM-oriented college courses. However, these students also have the option to explore non-STEM academic paths, but the converse is not possible.

Overcoming the Uphill Challenge

Only 37% of girls in India graduate from school with a science discipline, highlighting the need to address gender disparities in STEM education at the school level. While it has been established in the previous sections that the school education system is not prepared to cater to the STEM demand, the gravity of these challenges varies across different Indian states. The question of where the focus must be sharpened can be answered by understanding the interplay of educational attainment and socio-economic development in these states.

Figure 4: More than 85% of Women in The Eight States Opt for Non-Technical Education



Employment opportunities are witnessing a notable surge within the STEM sectors. While progress is being made in preparing students for the STEM-centric future, there is still a preference for non-STEM disciplines in India. According to the Periodic Labour Force Survey (PLFS) 2022-23, only 3% of women aged 22-50 years have technical education, compared to 6% of men in the same age group. This inclination, dictated by societal paradigms, is further accentuated by a gender bias.

According to the PLFS 2022-23 data, most (86%) Indian women between 18 and 30 years of age, with at least a higher secondary education, are from non-technical backgrounds. The situation becomes more concerning when we examine the educational backgrounds of women aged 22 to 30, particularly in the aforementioned eight states where the number of girls graduating from school with science disciplines is significantly lower.

At the national level, only 37% of girls graduating from Grade 12 are from the science discipline. This renders most girls unqualified to benefit from the increasing demand for STEM professionals in India. This number plummets to abysmally low levels in these eight states, highlighting the need for intervention and improvement.

STEM careers can create a virtuous cycle

Recent PLFS 2022-23 data reflects that women who undergo any form of technical education (even below degree levels like a diploma) have a higher probability of being in the workforce and a better chance of being part of higher-paying jobs/employment than women with non-technical education. The figure below further emphasises the role of STEM qualifications in empowering women and helping them participate in the workforce. The participation of more women in STEM fields, which are well-known for offering competitive salaries, can lead to a virtuous cycle of benefits, including the potential to considerably reduce the gender pay gap and amplify women's collective earnings.[20] Moreover, when women participate in the workforce, particularly within STEM domains, they become powerful agents of change, fostering economic growth that expands beyond personal financial gains to create a more inclusive and equitable economy.[21]

Figure 5: Difference in the Salaries of Women With and Without Technical Education (INR)

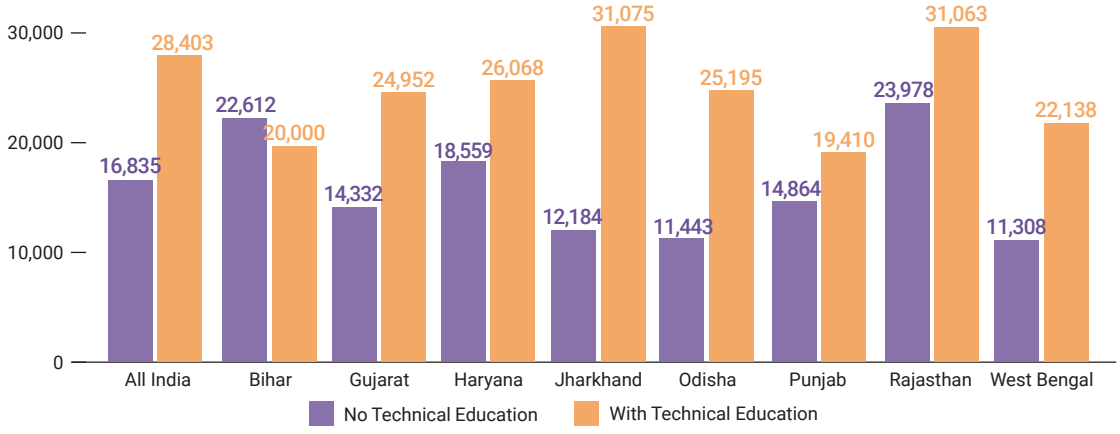
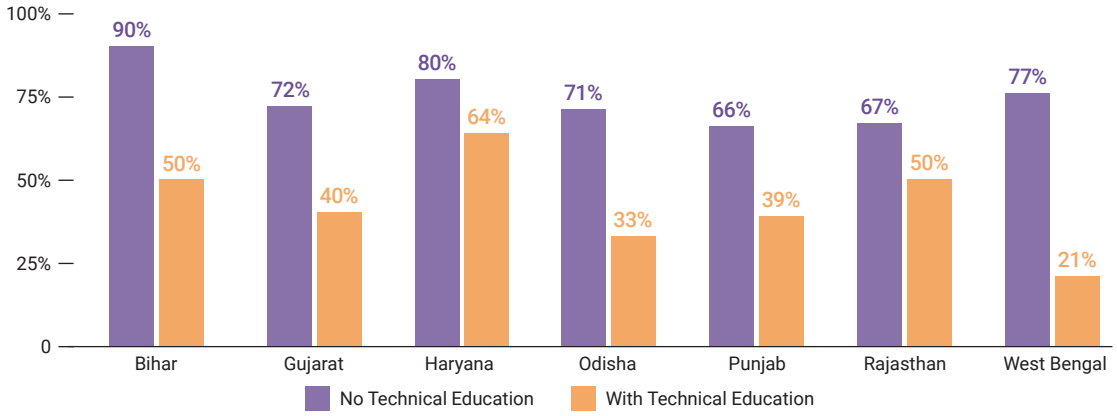


Figure 6: Women with Technical Education has Lesser Probability of Being Out of Workforce Compared to their Counterparts with Non-Technical Education



Source: Sattva Analysis of PLFS data 2022-23 [22]

Systemic challenges play a crucial role in poor uptake of science education in these states

The low uptake of science by girls in these states mirrors broader educational indicators, including low literacy levels (lower than the national average of 78%) and poor educational attainments. This reflects systemic challenges within the education system, such as inadequate infrastructure, limited access to quality education, and entrenched socio-cultural norms that hinder girls' participation in academic pursuits.

Figure 6: Female Literacy Rates (%)

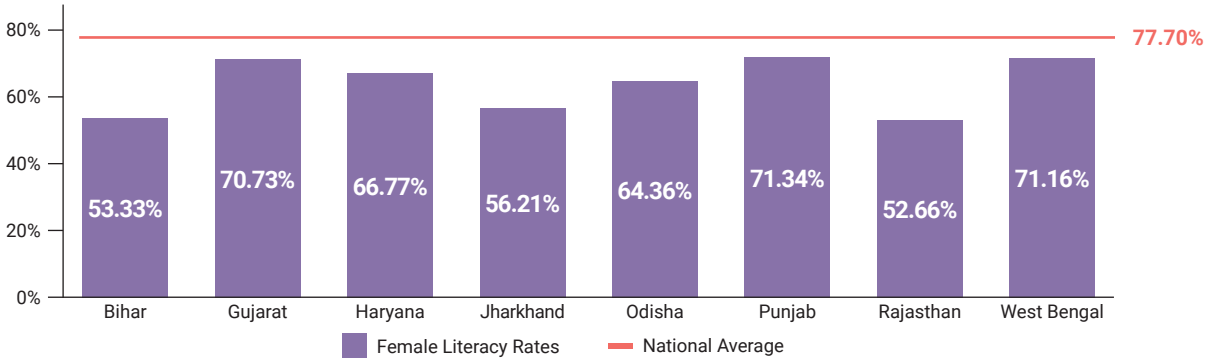
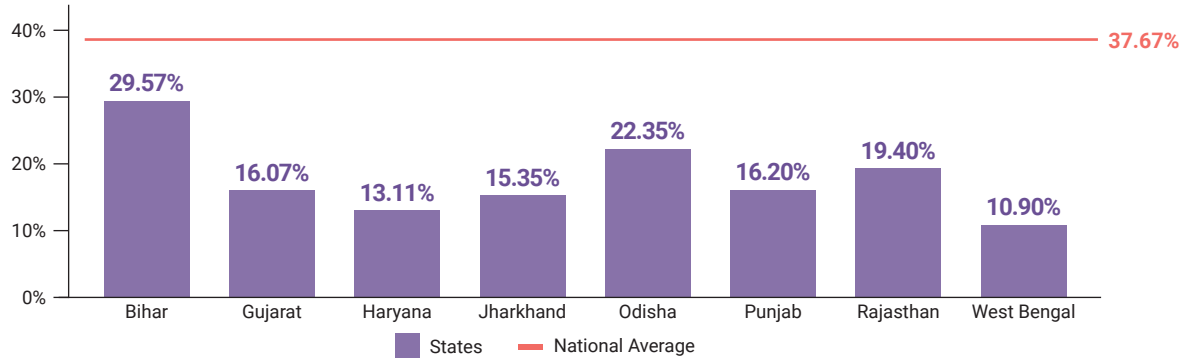


Figure 7: Proportion of Girls Passing HSC in Science

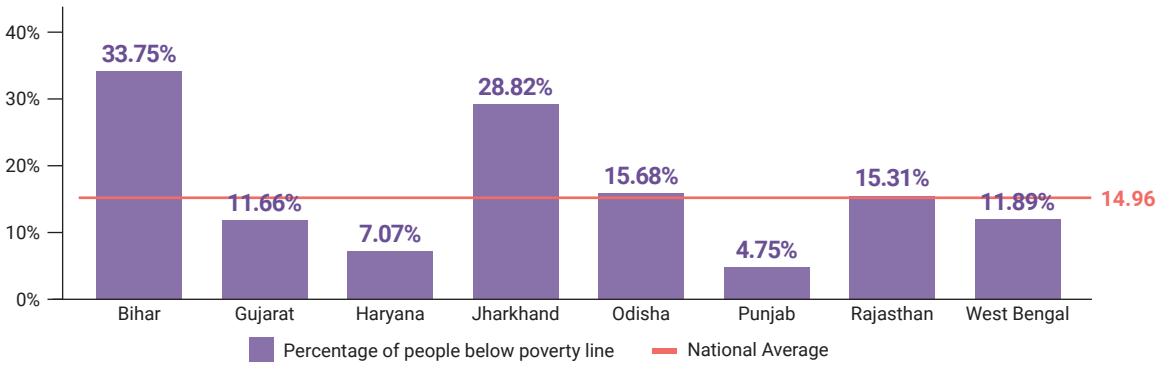


Our study suggests greater focus in these eight states, which are at a crucial juncture, bound by everyday struggles – lower rates of girls completing science education at the higher secondary level, societal norms that deter girls from pursuing science, and economic constraints that further limit opportunities. Addressing these multifaceted barriers is essential not only for promoting gender equality in education, but also for unlocking the full potential of girls and ensuring their active participation in the socio-economic development of their communities and the nation at large.

Societal norms, economic constraints, and healthcare challenges

The intricate web of socioeconomic challenges and health concerns paints a complex picture across various Indian states, disproportionately impacting girls and women. A concerning proportion of the populations in Bihar and Jharkhand lives in multidimensional poverty – an indicator that captures deprivations in health, education and living standards, in addition to income poverty.[23] Gujarat, Haryana, Punjab, and West Bengal fare comparatively better in mitigating multidimensional poverty. Meanwhile, Odisha and Rajasthan hover around the national poverty average of 14.96%, pointing towards varying economic well-being across different regions. The socioeconomic disadvantages for girls in these regions are compounded proportionately.

Figure 8: Multidimensional Poverty in India and Selected States



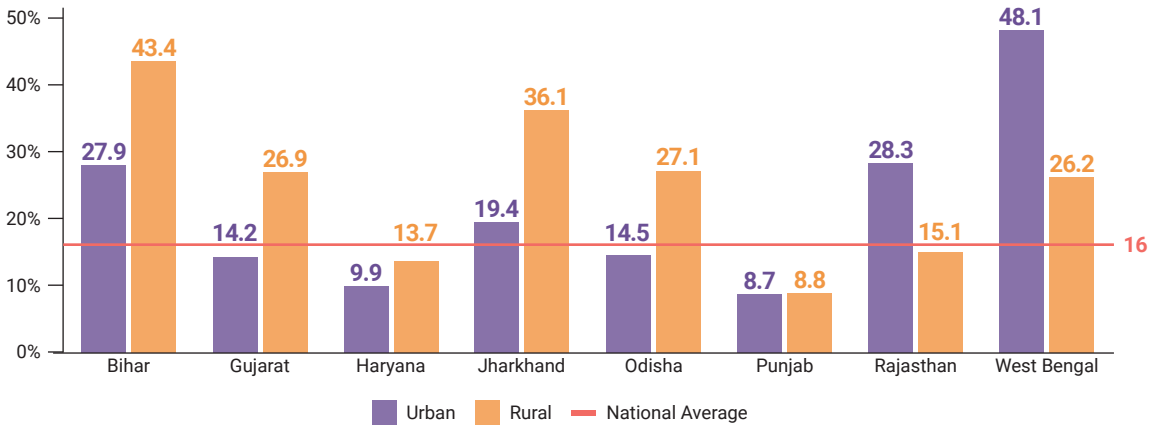
In the context of social challenges, West Bengal, Bihar, and Jharkhand demonstrate alarming patterns of child marriage, early pregnancies, and high maternal mortality rates. Underage marriages exacerbate the girls' socio-economic hardships, curtailing educational and employment opportunities.[24] More than 40% of women aged 20-24 in West Bengal and Bihar were married before they were 18.

According to NFHS-5 data, West Bengal, Bihar, and Jharkhand rank among the top five states with the highest incidence of teenage pregnancies.

Specifically, in these regions, 16% of women aged 15-19 in West Bengal, 11% in Bihar, and 10% in Jharkhand were reported to be either already mothers or pregnant at the time of the survey.

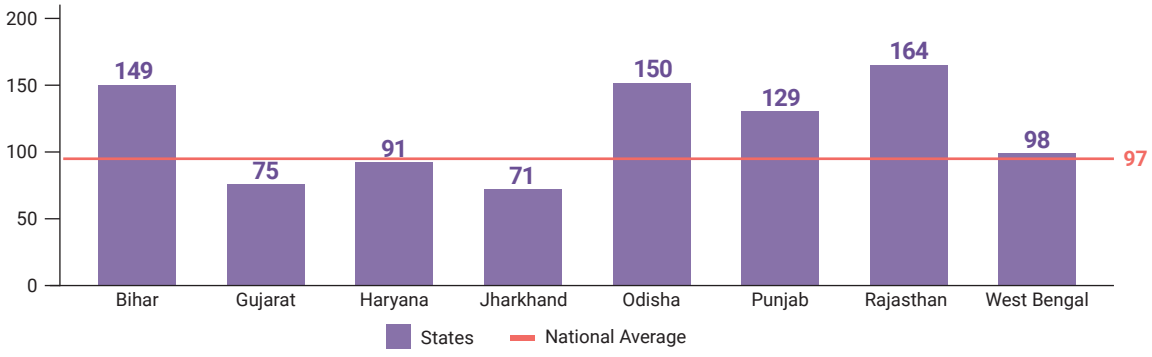
These numbers underscore the interconnection of teenage pregnancies with early marriage, educational disruptions, and economic standing. 53% of married women between 15 and 19 years of age have started childbearing. This number increases to nearly 18% for those without schooling, contrasting to just 4% among those with 12 or more years of education.[25] Rajasthan, Odisha and Bihar have very high maternal mortality, followed by Punjab and West Bengal.[26]

Figure 9: Underage Marriages: Proportion of Women (aged 20-24) Married Before 18 (%)



Such trends reinforce the pressing need for multifaceted interventions that target educating and training girls for decent work, which could lead to economic empowerment and enable them to address these pervasive issues. In terms of female labour force participation rate (FLPR) also most of these states are bottom performing as compared with the Indian average (33%); states like Punjab (24%), Haryana (19%), Bihar (10%), and West Bengal (28%) perform poorly as compared to the rest of the country.

Figure 10: Maternal Mortality Rate (maternal deaths per 100,000 live births)



Building STEM mindsets is the key to empowerment

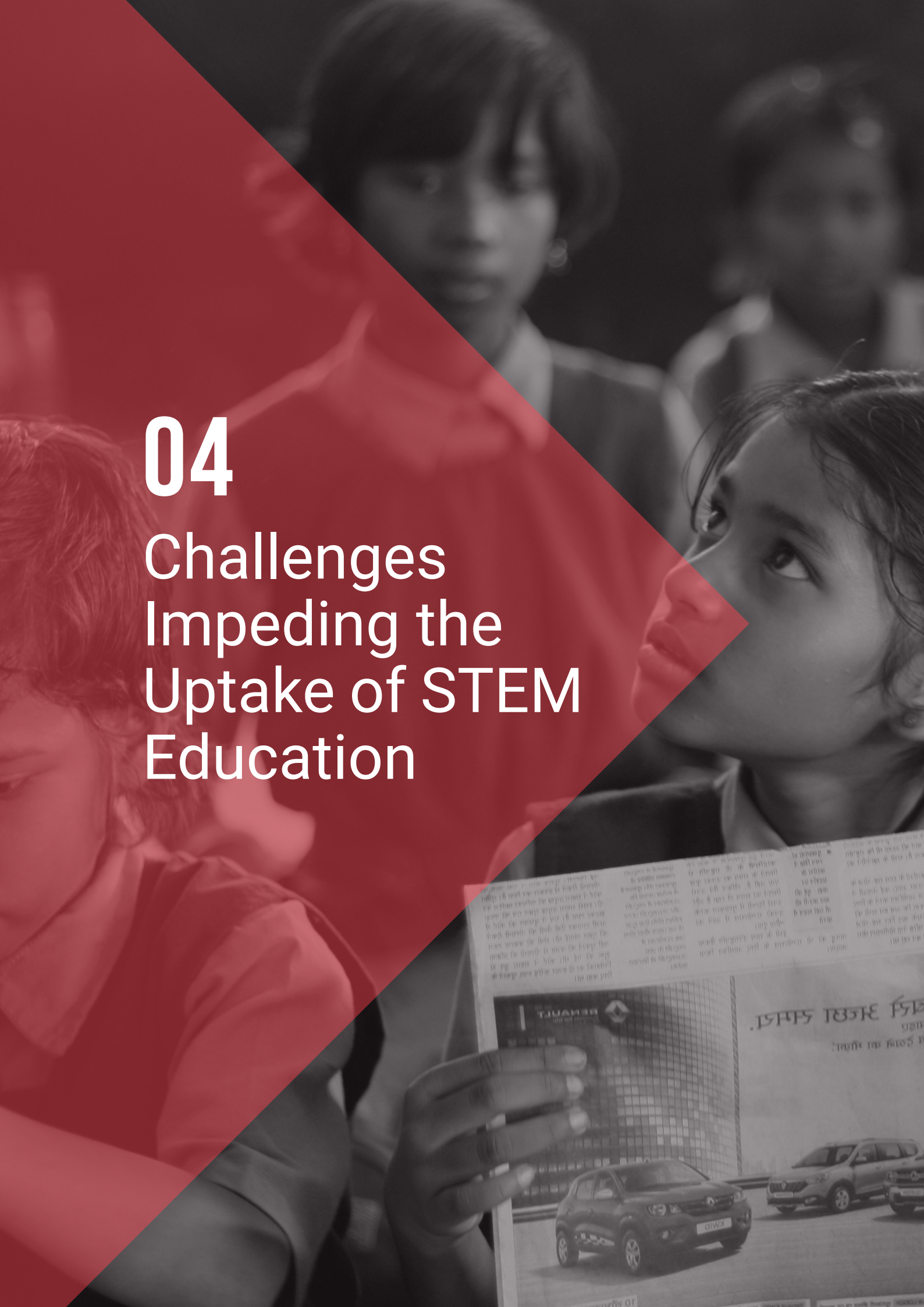
Fostering STEM mindsets in girls during their schooling years is pivotal, as it equips them with the necessary skills and mindset to seize future employment opportunities and actively

contribute to the workforce. Developing proficiency in science and mathematics is a well-established means to building curiosity and logical thinking in school. By placing emphasis on these subjects in middle and high school, the foundation for increased female engagement in STEM careers can be established.

Primary interviews with experts like Abhishek Gupta (YuWaah UNICEF), Yogesh Bhat (Founder, Masai Schools) and Urvashi Sahani (Founder, Study Hall) indicated the critical role schools can play in building STEM skills among girls in their foundational years. These interviews also highlighted that schools should not confine themselves to science and mathematics to build these skills, but should create more avenues through experiential learning to enable curiosity. Sajid Ali, (CEO, Tech Mahindra), emphasised that with growing opportunities for corporate social responsibility, establishing tech-enabled infrastructure and STEM labs can be achieved easily, thus enhancing opportunities for girls to study science and benefit from experiential learning.

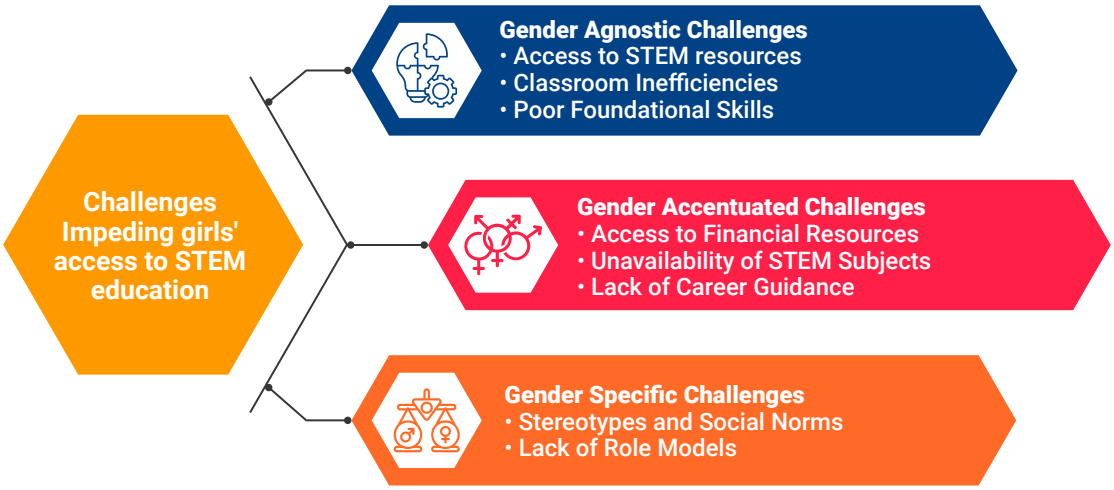
04

Challenges Impeding the Uptake of STEM Education



Research indicates that girls who achieve the same or even higher degrees are still underrepresented in mathematics or information technology. Although India ranks high in the percentage of women graduating from STEM in higher education (World Bank), Indian women scientists form only 14% of the 280,000 scientists, engineers and technologists employed in research institutions in the country.[27]

Multifaceted challenges at the school level impede girls' uptake of science subjects. By dissecting these challenges, this study aims to illuminate the existing intervention landscape and pave the way for inclusive strategies to foster a more equitable and diverse STEM education uptake in higher secondary grades.



Extensive primary research comprising interviews with more than 35 experts working towards enabling gender equality and equity in STEM education, highlighted three types of challenges that inhibit girls' participation in science education at the school level:

- Gender-agnostic challenges
- Gender-accentuated challenges and
- Gender-specific challenges

Gender-agnostic challenges

Gender-agnostic challenges affect all learners across gender boundaries. These include a lack of access to STEM resources, classroom inefficiencies and poor foundation skills.

Access to STEM Resources

Analysis of research published in the last 20 years highlights that the availability of resources like libraries and other school infrastructure is conducive to student learning. It also emphasised that teachers with excellent subject knowledge, having a more extended school day, and providing tutoring, all impact the interest and learning of the student.[28]

However, **resources such as trained teachers, science labs, and computer labs, essential for the practical aspects of STEM teaching, are lacking in many schools, particularly rural regions**. Schools face the challenge of inadequate infrastructure to enable tinkering opportunities for students, which is further aggravated in rural regions. Only 148,447 of the 276,840 secondary schools in India (54%) have integrated science lab facilities.[29] The absence of quality labs to provide hands-on experience further dampens students' interest in STEM subjects. A mere 46% of all schools have functional computers, with government schools at 36%, and private institutions at 72%.[30] **Only 24% of India's government schools have internet access**.[31] The situation is somewhat better for government-aided schools at 53% and private schools at 60%.

However, the situation worsens for the states in focus. **The Performance Grading Index of 2020-21 revealed a deficit in school infrastructure for integrated science and computer labs across the eight states**. Punjab and Haryana fare better in comparison to the remaining six states that lag in providing crucial infrastructure for integrated science labs. Gujarat, Bihar, and Jharkhand also lag in terms of integrated computer labs.

Figure 11: Performance Grading Index 2021: Availability of Integrated Science Labs

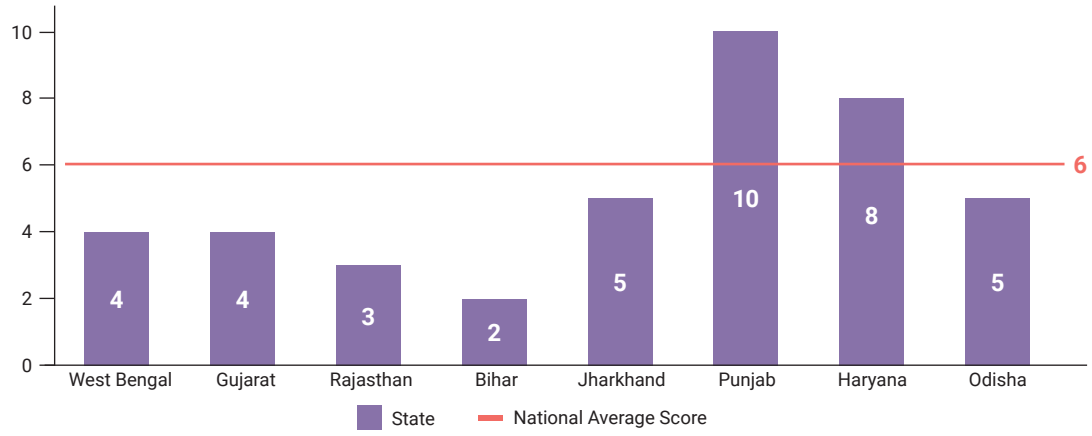
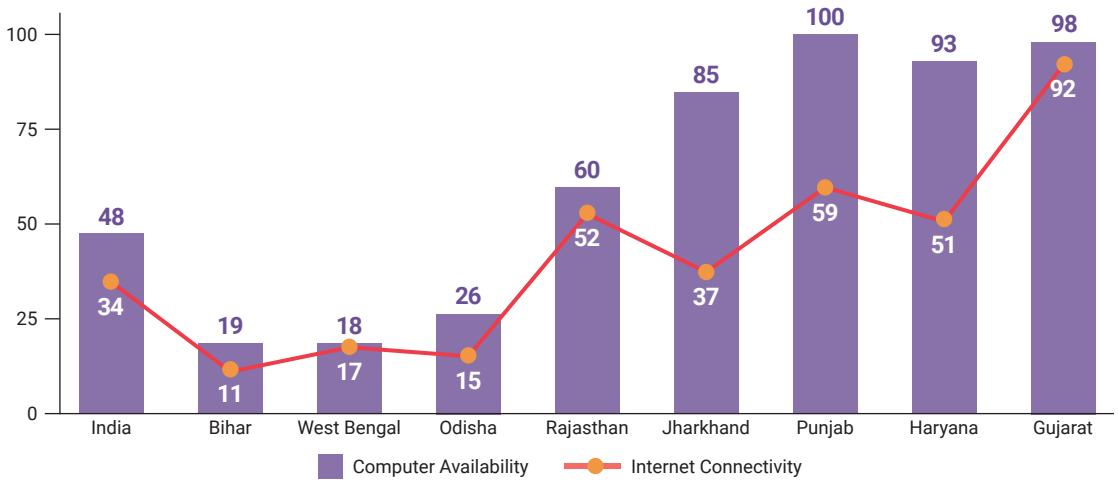


Figure 12: Percentage of Schools with Computer Labs and Internet Connectivity



The challenge is compounded by the underutilisation of labs and the administrative burden on senior science and maths teachers, detracting their focus from teaching. Primary research indicates that the irregular payment of temporary teachers, an overwhelming student-teacher ratio, and operational challenges, including vacant teaching positions in science and maths, further hinder students' ability to pursue STEM subjects, pushing them towards other streams.

Figure 13: UDISE 2021-22: Pupil Teacher Ratio at the Secondary Level

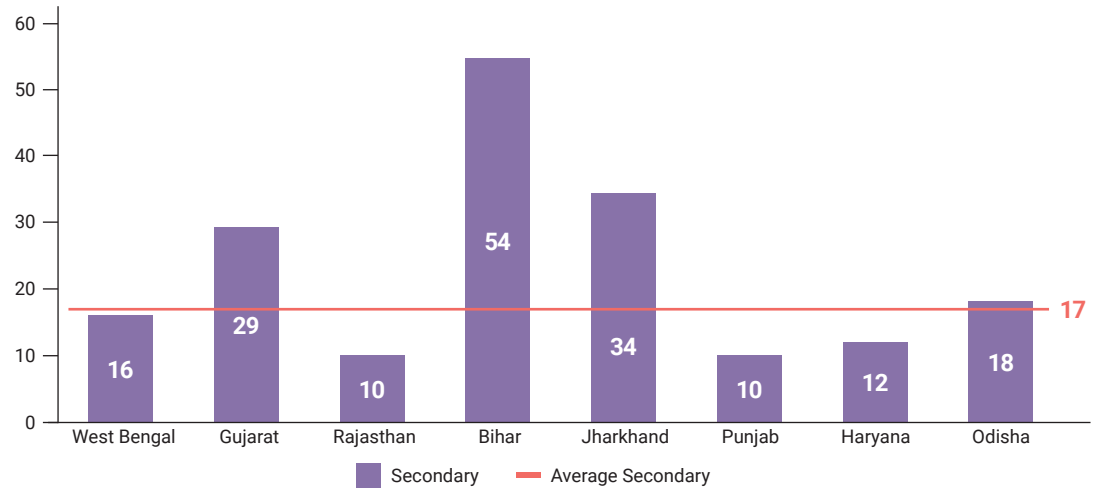
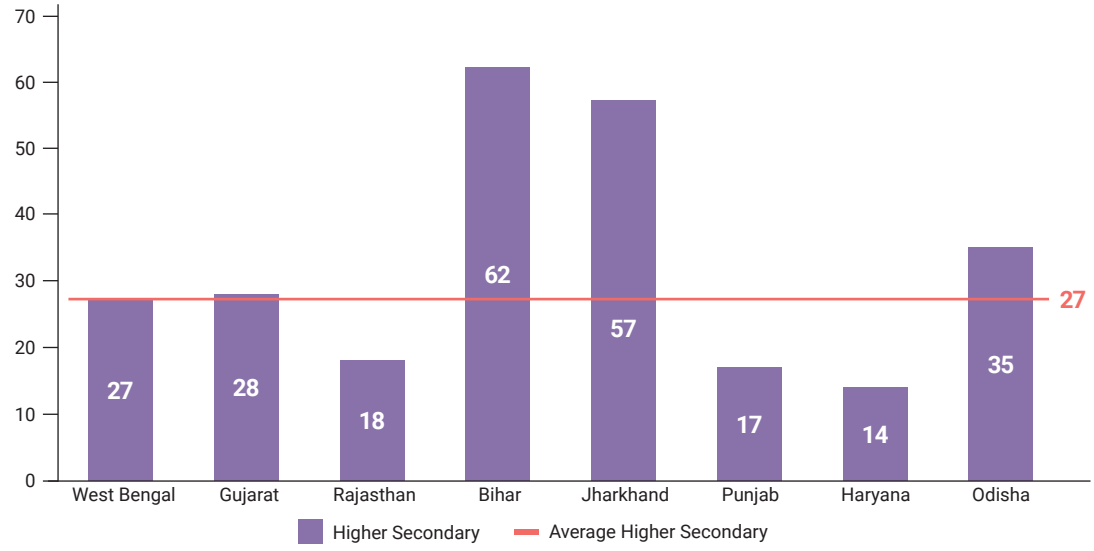


Figure 14: UDISE 2021-22: Pupil Teacher Ratio at the Higher Secondary Level



Classroom Inefficiencies

The middle and high school curriculum does not reflect ongoing advancements in STEM fields, continuing to retain outdated concepts devoid of contextual relevance and practical know-how. Curriculum and teaching methods greatly impact student enrollment in science courses. Courses heavy on memorisation with no opportunities for critical thinking and problem-solving skills discourage students from pursuing science subjects. Redundant

curricula hinder proficiency across subjects, stifling STEM mindsets and holistic learning outcomes.[32] For example, there is a noticeable gap in computer science education where students learn obsolete programming languages without exposure to modern coding practices and hands-on experiences. The extensive syllabus often remains uncovered due to the limited duration of active classes and lengthy vacation periods.[33]

The lack of participatory pedagogy, as highlighted by NEP 2020, leads to a bigger challenge. Conversations with experts substantiate that current teaching practices prioritise theoretical knowledge over practical application and critical examination of concepts. This limits students' ability to engage in innovative problem-solving and critical thinking. This educational model, characterised by lecture-based teaching, passive reception of information and a reliance on examinations, has been widely critiqued for its inefficacy and lack of engagement.

Teachers are pivotal in fostering student interest and achievement in STEM disciplines. However, a notable gap exists in their subject-matter expertise and pedagogical skills. Teachers who did not grow up with contemporary technology find it difficult to integrate modern tools into their teaching practices. Experts pointed out that the strict construct of a teacher-centric classroom leaves little room for curiosity to be built in the pupils. Dr Sandhya Gupta (Founder, Aavishkaar) and Surabhi Yadav (Founder, Sajhe Sapne), emphasised the importance of teachers' capabilities to enable subject proficiency in a joyful environment where learning can happen. However, in reality there is little focus on teachers' happiness, and on training them in practising gender-sensitive science pedagogy in classrooms.

There is an increasing recognition of the need to redesign assessments to evaluate a broader set of interdisciplinary and transdisciplinary skills. These often hinge on a narrow interpretation of content knowledge and rote learning, focusing primarily on discipline-specific skills. Prevailing assessment practices within the STEM education framework in India are inadequate in capturing meaningful learning outcomes and evaluating skills such as creativity, critical thinking, and applying knowledge in real-world contexts. The National Education Policy has highlighted the challenge of rote learning, and proposed changing the current system of evaluation from a marks-based assessment to the testing of conceptual understanding.

Poor Foundational Skills

Poor foundational skills act as barriers to STEM education uptake, impeding students' ability to grasp advanced concepts and engage meaningfully in STEM disciplines. Approximately a quarter of adolescents aged 14 to 18 struggle to read a text at the Grade 2 level in their regional language, and over half of them face difficulties with arithmetic competencies expected by Grade 5.[34] The urban-rural divide worsens the issue – urban students often demonstrate better skills and understanding in Mathematics, Science, and English, as compared to rural students. The difference in performance can be attributed to regional disparity, reflecting differential access to quality education.

Gender-accentuated Challenges

While some hurdles to STEM education are universal, certain challenges are exacerbated by gender dynamics, affecting girls disproportionately. These gender-accentuated obstacles often arise from a lack of access to financial resources, unavailability of STEM subjects and biased career guidance.

Lack of Access to Financial Resources

A systemic lack of financial support stops students from participating in STEM programmes. The cost of pursuing STEM subjects in urban higher secondary schools is 139% higher than the cost of studying humanities.[35] Similarly, in rural areas, STEM education is 58.5% more expensive than humanities.[36] Students need financial aid to meet the cost of tuition fees, additional study material, and quality coaching for entrance exams. Even where scholarships are available, the process of accessing these resources is extremely long and often convoluted, while not being tailored to the specific needs of girls. Adding to this, the supply for these scholarships does not match their demand. For example, Neha Aggarwal (Chief Strategy & Growth Officer, Buddy4Studdy) stated that Buddy4Studdy received 55,000 applications for 350 scholarships provided under the Kotak Kanya Scholarship. She also pointed at the high transaction cost for smaller scholarships necessary for students to pursue science discipline, and coaching to compete for higher education admissions. Vijay Roy (Founder, Scholarify) also highlighted the lack of scholarships for students pursuing science subjects in higher secondary grades.
Exacerbating this problem is the fact that the decision to invest in a child's education is often influenced by the perceived return on investment, which traditionally favours boys. This results in a lower prioritisation of education for girls in case of financial constraints, leading to parents discouraging girls from pursuing STEM fields. Dr Indumati (Independent consultant) highlighted that parents also strategise which child goes to private coaching and which one goes to government school, depending upon their means.

Unavailability of schools offering STEM subjects

In rural areas, only 38% of households have a secondary school within 1 km, while in urban areas this number stands at 70%.[37] Additionally, most schools in India are primary schools (11,96,000), followed by secondary (1,50,000) and higher secondary schools (1,42,000).[38] This relative scarcity obstructs students' transition from primary to secondary and higher secondary schools. The absence of schools offering STEM subjects in close vicinity also deters the prospect of pursuing STEM education for students.

Mobility and safety issues, coupled with the perceived priority of domestic duties amplify the impact of this problem for girls. The headmaster of a government secondary school in Udrasar village, Rajasthan, pointed out that due to the distant location of the STEM college, girls refrain from choosing the science stream in school. Pursuing subjects that are manageable alongside household activities, and with minimal attendance requirements are considered more feasible. Focussed group discussions with girls from Orissa pointed out that due to the lack of colleges offering science subjects in the vicinity of their village, they tend to study non-STEM disciplines.

Career Guidance

93% of Indian students are aware of only 7 out of nearly 250 career paths available across 40 domains covering 5,000 job types in India, indicating a severe lack of awareness about diverse professional avenues.[39] The absence of career guidance and mentorship in STEM fields leaves potential talents in these areas untapped. Primary interviews suggest a need for enriched professional development for teachers, which could enable them to impart relevant career guidance and foster a supportive environment for students in STEM. Focussed group discussion also pointed to poor awareness of career opportunities after choosing science subjects, which according to most respondents were tough to grasp, expensive and difficult to access, resulting in little motivation to take up STEM disciplines.

Even within STEM, however, women are often steered towards fields that are perceived as more nurturing, such as teaching and healthcare. Sunita Menon from Breakthrough expressed that even the professions are distinctly classified as 'male' or 'female', subtly instilling in girls the notion of predefined paths they are expected to follow. Engineering, for instance, is considered "masculine", as compared to teaching and nursing, considered "feminine" professions. Girls' exposure to women taking up care roles also influences their decision to take up non-STEM subjects in higher secondary grades. Dr Urvashi Sahani cited that after the eighth grade, girls are given an option to choose Home Science instead of Mathematics, which acts as a deterrent for girls from opting for science discipline in higher secondary.

Gender-specific Challenges

Gender-specific challenges are unique barriers that girls face as a result of their gender. These challenges stem from a complex interplay of cultural, institutional, and structural factors, perpetuating disparities in opportunities, resources, and support for learners of different genders.

Stereotypes and societal norms

Research highlights that parental involvement is important for children's educational achievements, as the former exert the greatest influence on their children's future careers.[40] A girl's family and community play a major role in shaping her thought processes during her formative years. Studies highlight that households across different states in rural and urban India prefer to incur more expenditure on education for male members than for females. The gendered approach to development in early years tends to hinder the development of a strong sense of self and agency, leading to low aspirations towards STEM careers.

Pervasive societal perception discourages girls from venturing into subjects deemed 'masculine', exacerbating the skills gap. Different forms of biases, ranging from overt discouragement to subtle nudges towards traditionally feminine roles, further impede girls' progress in STEM fields. The lack of parental aspiration towards girls' careers leads to a significant number of girls being married off before the legal age of 18. Such practices are underscored by the perception of daughters as economic liabilities, prematurely halting their educational journeys.

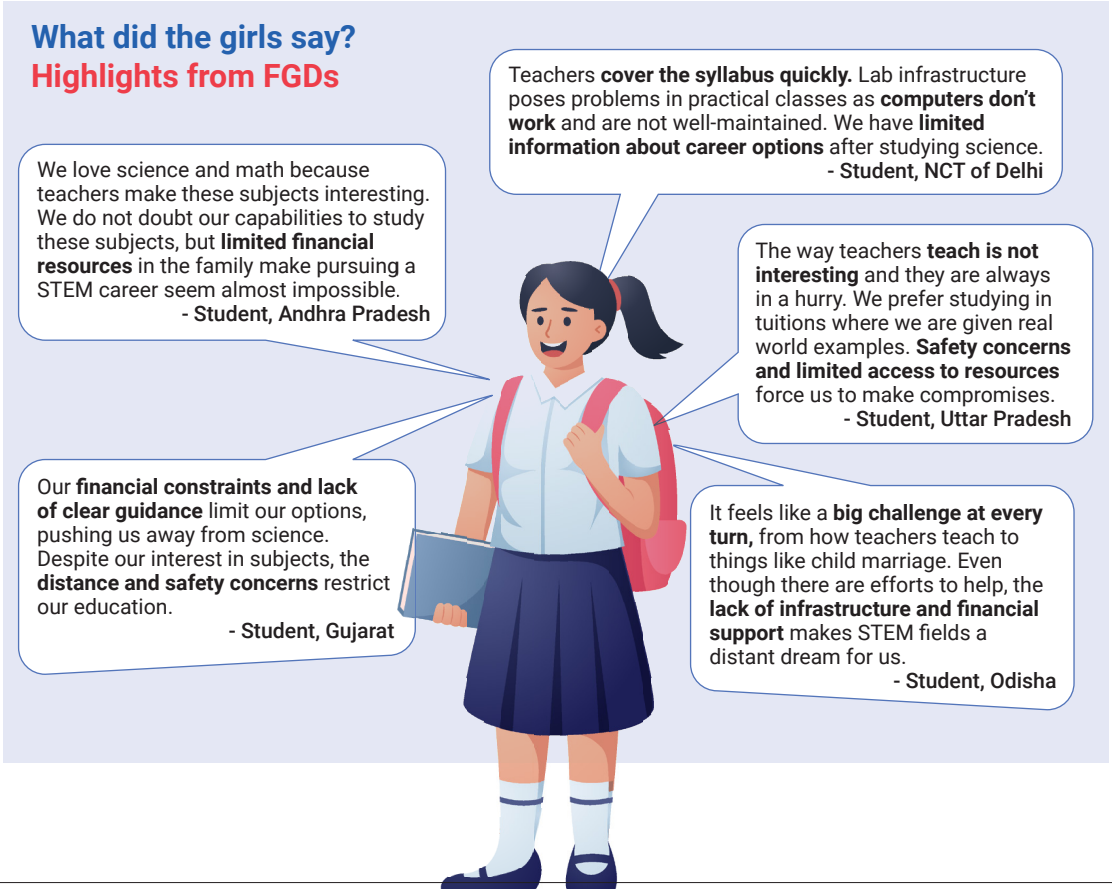
The intersection of caste and gender puts girls at a greater disadvantage. Girls from underprivileged communities also face economic disadvantages. Traditional norms determine the role that members from a specific caste can play in the social hierarchy. This influences the confidence that a family can instil in their daughter, and eventually, their readiness for domains that are historically male-dominated and accessible to privileged groups.

Lack of role models

The absence of relatable female mentors reinforces stereotypes about the appropriateness of certain professions for women, and perpetuates a cycle of exclusion. Role models are required to guide girls through the challenges of STEM education and careers, offering advice, encouragement, and practical strategies. The absence of visible, successful women in STEM careers fails to challenge prevailing stereotypes, reinforcing the notion that these fields are bastions of male dominance.

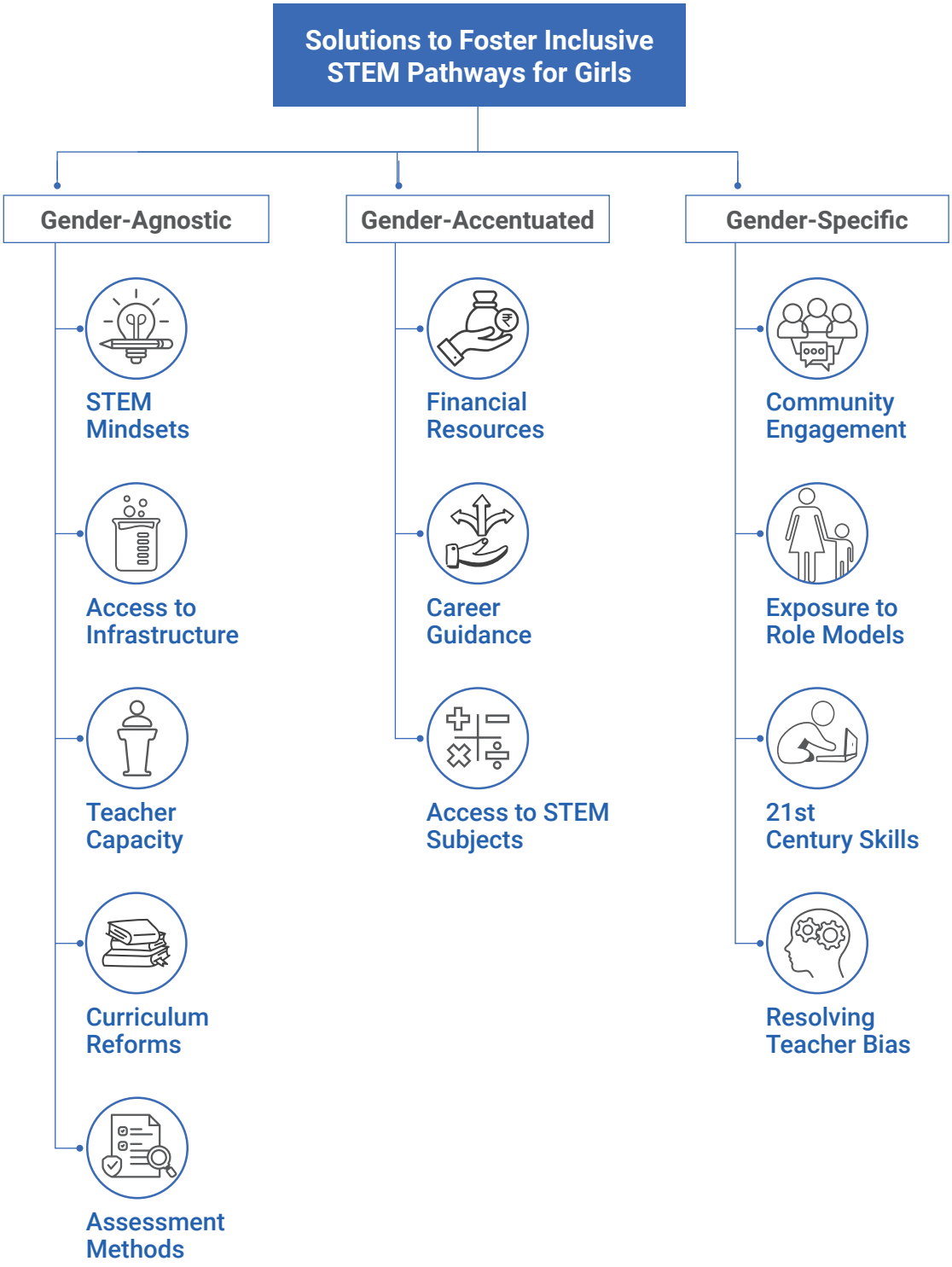
The lack of gender-inclusive representation in textbooks and instructional content perpetuates the systemic gender imbalance in these disciplines. When educational materials predominantly feature male scientists, engineers, and mathematicians, it sends a subtle, yet powerful message that these fields are not meant for women. Moreover, explanations of concepts often rely on examples and scenarios that reflect stereotypically male interests and experiences, making it difficult for female students to relate and engage fully with the material.

These challenges were reinforced during the focussed group discussions that were conducted with 65 girls between Grade 9 and 12 across nine states in India.



05
Existing Solution Landscape

Recognising that the journey towards gender parity in STEM requires tailored approaches, the report identifies three distinct types of solutions based on gender-agnostic, gender-accentuated, and gender-specific challenges that are prevalent among the interventions, to establish gender equity in STEM in the focus states..



Gender-agnostic Solutions

Gender-agnostic solutions aim to create an environment equally conducive to realising the potential of students of all genders. These focus on fundamental aspects, such as building STEM mindsets, establishing **equitable access to infrastructure and teachers, and improving classroom processes**.

Developing STEM mindsets

Tinkering and hands-on experiences act as catalysts for students as they foster a sense of curiosity, exploration, and autonomy among learners, which are essential components of STEM education. Innovators like Curiosity Gym, Blix Toys and ExperiFun design and develop hands-on, innovative STEM products for K-12 to bring experiential learning for students in Science, Maths, Computers and Robotics like dismantling gadgets, and transforming theoretical knowledge into tangible skills. **Atal Tinkering Labs** encourages students to understand scientific concepts, get experiential learning opportunities and find innovative ways to solve local challenges through creating prototypes with the help of online mentors. Shubham for ATL noted that rural school students look at solving local health and WASH-related challenges. In contrast, the urban students create models to solve urban issues like traffic congestion.

Exposure visits, including summer camps, college visits, hackathons and exhibitions, can play a vital role in developing a STEM mindset by providing real-world contexts for learning. These opportunities allow students to interact with professionals, engage in experiments, and explore cutting-edge technologies, sparking excitement about STEM subjects. Initiatives like Vigyan Mitra – Pratham's after-school initiative – and Pi Jam Foundation's classroom programmes expose students to real-world problem-solving.

Teacher capacity (availability and proficiency)

Several interventions seek to build teacher capacity for imparting gender-sensitive STEM pedagogy to students. **UNESCO has suggested implementing a clustering model for expert STEM educators** to address teacher unavailability, improving access and educational quality.[41] The NEP 2020 has suggested overcoming resource challenges by creating cluster-level schools based on the hub and spoke model.

Leveraging technology can also help bridge gaps in teacher availability, particularly in underserved or remote communities. Virtual classrooms and digital learning platforms such as FILO offer opportunities to connect students with qualified instructors regardless of geographic limitations.

Enabling the digital readiness of teachers to use platforms like DIKSHA and WhatsApp for content sharing enhances classroom efficiency and knowledge exchange. Educators in Andhra Pradesh utilise platforms like APPST and WhatsApp groups for knowledge-sharing. As part of teacher training in Punjab, Breakthrough aims to ensure accessibility of gender-sensitive curriculum, available on DIKSHA in collaboration with Shiksha Lokam

Access to infrastructure

Technology-rich environments – including STEM Labs, Tablets and Smart Boards – foster student engagement, collaboration, and critical thinking skills, which are essential for success in STEM disciplines. The provision of mobile labs and cluster labs by organisations such as Agastya Foundation, Tech Mahindra Foundation and United Way Bengaluru enables access to state-of-the-art equipment and resources for students. Edtech solutions, tablets and other mobile devices by initiatives like Nanhi Kali and Khan Academy provide students with versatile tools for personalised learning.

Digital infrastructure such as online learning management systems, virtual libraries and resource hubs can disseminate a wealth of resources (books, lesson plans and instructional videos) for both teachers and students. Platforms like DIKSHA and OLabs which provide quality e-content for school education, act as unified content hubs, eliminating the confusion caused by multiple sources.

Performance-based promotion strategies, building innovative teaching methods and creating processes for transparency in teacher initiatives help in building teacher proficiency. The outcome of students' education can be attributed to the teachers instead of linking them to the students themselves. These outcomes can be connected to the promotion criteria for teachers. Integrating innovative teaching methods, such as the visualisation of abstract concepts and the use of multimedia presentations makes learning more engaging for students. The Andhra Pradesh government ensures that teachers upload innovative methods used in classroom processes on WhatsApp groups. This inspires teachers to showcase and improve their teaching methods. State governments such as Assam are mapping schools to engineering colleges, where the teachers are trained to deliver STEM education and utilise the digital infrastructure.

Curriculum reforms

Curriculum reforms are necessary for the creation of immersive learning experiences, where students can engage with science to solve everyday life problems. Making science subjects relatable to the student's real-world builds curiosity and affinity towards subjects. It is critical that the curriculum also enables concept building. More examples of Indian scientists and directions for teachers to do certain experiments with locally available material would go a long way in building an inclination towards STEM.

Embracing peer learning and vernacular languages in STEM subjects can democratise education further, empowering students across diverse linguistic backgrounds. During the teacher interviews, Mr Sreehari Karamala, a Physics teacher from Andhra Pradesh explained how this helps,

> ***"Initially they just read from the right-hand side of the textbooks, where the content is in Telugu. Slowly, their focus starts shifting towards the left-hand side pages of the textbooks that are translations of the Telugu text in English."***

Remedial education has also emerged as a viable strategy to provide further support, in building subject proficiency allowing clarification of doubts post-regular classes, and addressing the added challenge of limited school-time engagement. Organisations like **Gyanshala** (primary grades) and Sajhe Sapne (adolescents), focus on creating curricula that incorporate various aspects of a child's approach and engagement with the learning process. Interventions like the Bharat EdTech Initiative (BEI) that enable learning through the use of smartphones available to parents have enabled access to EdTech to one million students.

Assessment Methods

Reimagining the design of assessments, and shifting from traditional summative evaluations to formative assessment tools aids in tracking the nuanced progress of each student's learning journey. Pratham, in association with UNICEF has shown a drastic increase in the learning levels of students of Assam by introducing formative assessments in classroom practices.[42] It not only gauges scores, but also fosters critical thinking and problem-solving skills. Quest Alliance is trying to solve the challenge of personalised assessments by leveraging AI to design context-based learning and assessment modules for students based on their interests, hobbies, areas of improvement and so on. Dr Indumathi S., Lead Researcher from Tata Institute of Social Sciences, highlighted that Continuous and Comprehensive Evaluation (CCE) is a potential continuous assessment methodology that can replace existing exams or projects, where students end up reproducing information from the internet.

Solutions to Gender-accentuated Issues

These solutions address disparities exacerbated by gender dynamics in STEM education. These include broadening access to financial resources, enhancing the availability of STEM subjects through community-driven interventions and providing unbiased career guidance.

Financial Resources

Scholarships and needs-based aids bridge the gap in access to quality STEM education and alleviate the financial distress of families. By offering resources like scholarships, students are empowered to compete on an equal footing. Scholarships provided by initiatives such as IBM STEM for Girls, CBSE-UDAAN and Foundation for Excellence are instrumental in democratising access to opportunities in STEM fields. Availability and access have to be improved, and technology can play a big role in this. Improving access to, and awareness about government schemes and other scholarships is equally important. Buddy4Study and CIFF's project UDAAN enable this by streamlining and digitalising scholarship processes.

> ***"Scholarships not only help the parents financially but also add an extra bit of confidence and pride for their daughter. It develops the thinking that since somebody paid our daughter to go to college, she must be good at studies."***
>
> — **Parul Jauhari,** Associate Director – Research & Evaluation, Avanti Fellows

It is essential to introduce innovative finance products such as impact bonds and income-sharing agreements to education, to advance the uptake of STEM education. Banks such as Bank of Baroda are offering 'Vidya Loans', which are available for school education at accredited schools from nursery to Grade 12. Development Impact Bonds such as Quality Education India – which has improved learning outcomes for 2,00,000 school children in grades 1 to 8[43] – and Educate Girls which has improved the quality of education for 15,000 girls in Rajasthan,[44] are proving the efficacy of this instrument. Organisations such as Masai School and NavGurukul are implementing 'Study Now, Pay Later' models where the tuition fees of students from low-income backgrounds and rural areas are deferred until they secure employment.

Career Guidance

Clear visibility of career pathways is equally critical. Availability of information, awareness of opportunities and understanding of career pathways is significant for girls from low-income families with limited resources, specifically for female students who are mostly second on the priority list in such cases.[45] Several school-level interventions provide career guidance and mentorship to the students. One of the most successful initiatives has been the Atal Innovation Mission's 'Mentor India' programme wherein skilled professionals provide pro-bono mentoring to school students.[46] Alohomora Education works with high school teachers to guide students through career decisions. **Divakar Sankhla, Founder, Alohomora Foundation, who works closely with the Delhi Government, stated,**

> ***"We've discovered that empowering teachers to lead career guidance initiatives creates profound impacts. Their genuine interest in students' career development, coupled with the right tools and training, not only enhances student outcomes but also fosters a culture of guidance and mentorship that goes beyond traditional classroom learning."***

Internships and apprenticeships provide a testing ground for students to apply their analytical acumen that can be honed into professional expertise. It is imperative for industry to actively participate in these initiatives, offering meaningful opportunities that align with the evolving needs of the workforce. **Medha** and **Lend a Hand India** emphasise building relations with local employers for students' internships, giving them opportunities to explore career options and building clarity of their future.

Access to STEM Subjects

One key aspect of encouraging more girls' participation is the provision of resources for mobility and accessibility, such as bicycles, books, and hostels. **Community-driven interventions, such as collective travel to educational centres, and residential programmes** such as those offered by **NavGurukul** and **Sajhe Sapne** have shown promise in ensuring safety in numbers and fostering a supportive network.

Gender-specific Solutions

Gender-specific solutions target the distinct needs and challenges faced by young girls, emphasising community engagement, the development of 21st-century skills, exposure to role models, and addressing teacher bias. By implementing interventions tailored specifically to mitigate gender-specific barriers, gender-specific solutions aim to create pathways that empower and inspire young girls to pursue and excel in STEM disciplines.

Community Engagement

Building parents' aspirations for their girls in STEM can significantly contribute to increasing gender equality in STEM education. Communicating tangible benefits and scholarships associated with STEM education to parents by leveraging engagement platforms like School Management Committees (SMCs) and Parent Teacher Meetings (PTMs) act as enablers for parents. Identifying model parents from the community is an important outcome of this process, to highlight stories of positive deviation, which motivate and engage other parents living in similar environments and circumstances. Project Nanhi Kali selects a female community member in every village, who is responsible for interacting with the community and the parents and handling their apprehensions.

> ***"We engage with parents through meetings on different topics. For example, there was a stargazing session that all the parents did together. We ensure that whenever possible, children are exposed to women doing different types of jobs. This normalises the idea of working women, which is very important in a community."***
>
> — **Radhika Yelkur,** National Head – Project Nanhi Kali

Identifying community champions can also be instrumental in increasing gender equality in STEM education. NGOs conducting community programmes can collaborate with local bodies like panchayats to conduct campaigns on career awareness and science fairs, where the science and maths capabilities of young girls from the community are showcased and applauded Akshara Foundation's Ganita Kalika Andolan organises Gram Panchayat Contests involving the community to understand the reality that even girls can do maths. It also opened the opportunity for dialogue between the parents and teachers regarding the capabilities of their wards.

21st Century Skills

Conversations with experts revealed that fostering agency in girls to navigate gender norms is key. Organisations like Sajhe Sapne apply learning principles to empower girls to question biases, understand themselves, and pursue STEM careers supported by technical skills and guidance. Initiatives like the **Feminist Approach to Technology** (FAT) focus on digital skills to boost self-esteem and career aspirations. At the same time, **Project Nanhi Kali** emphasises financial literacy to empower girls in decision-making and eventually build their life skills. This builds skills like negotiation, self-awareness and critical thinking.

Exposure to Role Models

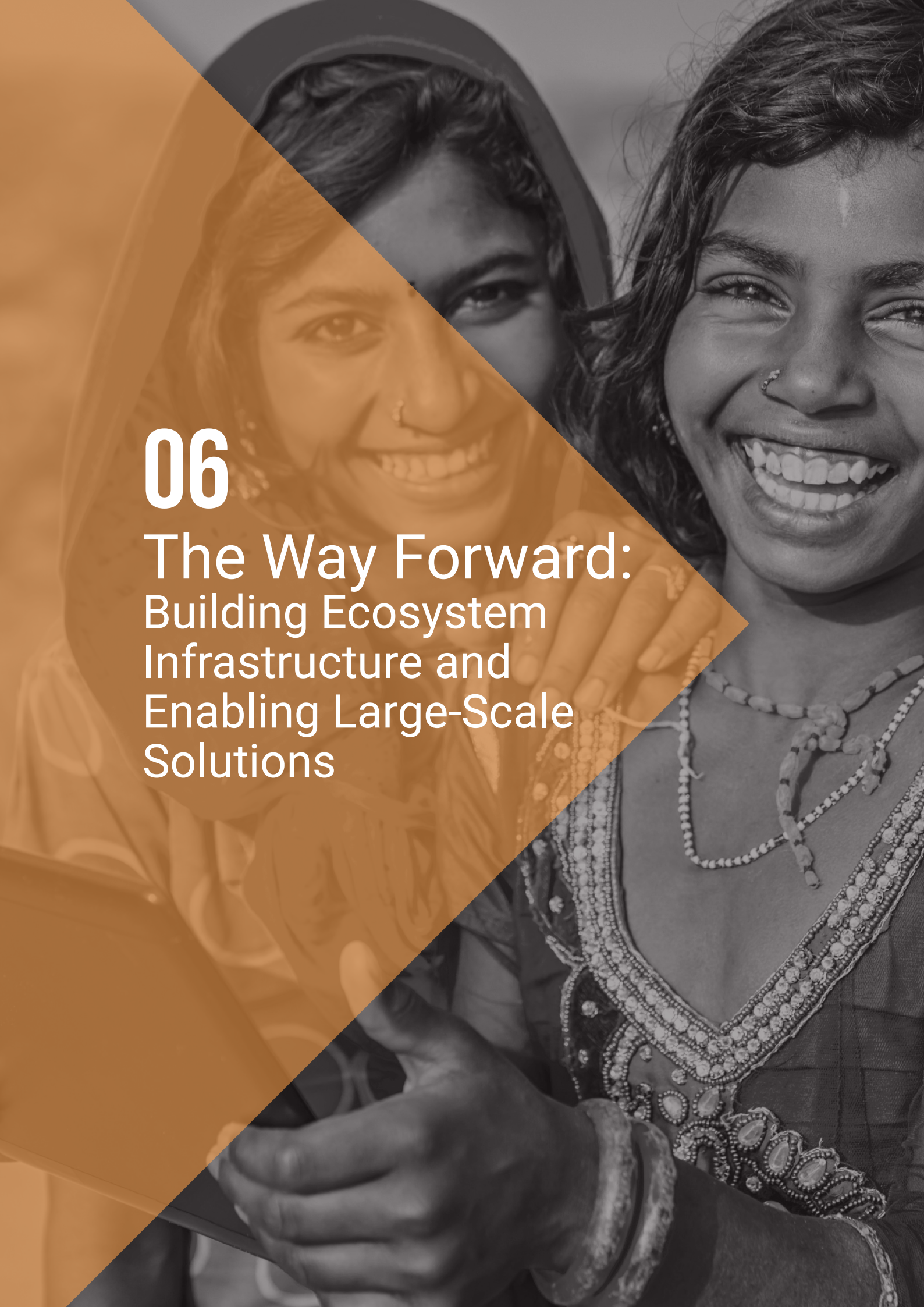
Providing exposure to role models emerged as a key solution for building aspirations towards STEM careers. A research study in rural West Bengal captured the influence of reserving seats for women in local body elections, on high school girls. The study highlighted that the visibility of women in leadership roles erased the gender gap in adolescent educational attainment.[47] One of the experts, Mr Anand Mohan Tiwari, recommended having a booklet on local girls who have achievements in STEM fields to be shared with school girls. The focused group discussion with school girls revealed that those who witnessed their seniors taking up STEM careers had a clear vision for their future aspirations. Exposure to accessible and relatable female role models can help young girls navigate their STEM careers and pathways as they transition from one grade to another, or from school to college.

> ***"When a set of young kids look at somebody from their locality who is now working in a metro city, they believe that if this person can do it, I can do it as well. It can be a good motivator if the mentor can also speak the same language, which is an important factor."***
>
> — **Manoj Balachandran,** Regional Director – South, American India Foundation

Resolving Teacher Bias

Integrating a gender lens into teacher education programmes (like B.Ed. and B.El.Ed.) is essential for fostering transformative pedagogy and equipping teachers to encourage curiosity in students towards STEM fields. Helping teachers identify their own biases, and giving them techniques to overcome them, both pre-service and in-service, play a significant role in creating equitable learning environments.

Addressing the complex challenges hindering young girls' interest in STEM fields necessitates a holistic approach. It is imperative to devise an integrated strategy to foster the engagement of all young minds in STEM pursuits. Implementing scalable solutions for girls' financial inclusion and providing hyper-local career guidance can elucidate viable career pathways and facilitate financial support for STEM pursuits. Moreover, enabling the government to craft a national life-skills approach to build 'STEM skills and mindsets in girls' aimed at empowering girls to navigate prevailing gender norms is essential for informed decision-making. Addressing gender stereotypes and parental aspirations through constructive community interaction interventions is crucial. A community-driven movement is imperative to instigate a mindset shift in parental and societal attitudes toward girls' careers. Addressing these key issues is vital for fostering greater STEM uptake, particularly in the eight underrepresented states. This collective effort can pave the way for the next generation of women in STEM, ensuring equitable opportunities for every girl to aspire and excel in this domain.



06

The Way Forward:
Building Ecosystem Infrastructure and Enabling Large-Scale Solutions

It is encouraging to note that solutions are being actively developed across all identified challenges, whether gender-agnostic, gender-accentuated or gender-specific. However, existing solutions are implemented in silos, and have limitations in achieving population scale. For these initiatives to be scalable and sustainable, it is critical to take an ecosystem approach in building public infrastructure, which can support the work being done by many organisations to implement gender-intentional programmes. This DPI will leverage the collective strength of various stakeholders, from government schemes to non-profit initiatives and private sector innovations and enable more girls to take up STEM. It is critical that equal investments are made in public goods to enable solutions to work for millions of girls across the country enabling solution providers to scale their reach.

As a way forward, the report proposes four vital ecosystem-wide solutions to advance gender equality in STEM:

1. Building an open network ecosystem for scholarships and financial support
2. Building a digital public infrastructure for career guidance and mentorship
3. Constructive action with community on shifting gender norms on STEM
4. Leveraging assessments to enable state action in STEM skills for girls

The implementation strategies of these recommendations were collaboratively outlined during a co-creation workshop on 'Gender Equity in STEM' organised as a part of the SKI Annual Summit 2024, held in Delhi on February 23rd. The strategies discussed ensure a comprehensive approach that leverages the strengths of multiple stakeholders and experts to tackle gender-agnostic and gender-specific challenges effectively.

Recommendation 1: Building an Open Network Ecosystem for Scholarships and Financial Support

Research has established that due to a lack of financial resources, many girls, especially those from economically disadvantaged backgrounds, struggle to obtain quality education and opt for STEM disciplines. Students face several challenges when availing scholarships or loans as means of financial support for their education. At the same time, scholarship providers face many challenges in discovering eligible candidates for these scholarships or loans.

Demand-side challenges

1. Lack of awareness among girls and their parents regarding the availability of financial aid for STEM education.
2. It is difficult to navigate the cumbersome process of applying for scholarships/loans, especially for girls with little support from family members.
3. Lack of small scholarships for school completion (owing to the higher cost of admission in higher secondary schools offering Science and other related costs for studying science - lab fees, computer fees, costlier books).

Supply-side challenges

1. Difficult to identify and reach the most deserving candidate.
2. Complexity of the different types of financial support provided by different providers:
   - Non-repayment, no-interest scholarships
   - Interest-free with repayment
   - Low-cost, low-interest loans with repayment
   - Repayment of loan based on future income
3. There is a mismatch between the timing of the scholarship (based on different application dates of educational institutions) and the needs of students.
4. High transaction costs for the provisioning of fellowships/loans for small amounts and long duration.
5. It is challenging to get the credit history of the students from Tier 2-3 cities and verify their credentials to enable low cost loans.

The availability of **scholarships** on the open network for girls pursuing science discipline in higher secondary grades could simplify the application process and reduce the time to avail scholarships and their transaction costs, making it feasible for the scholarship providers to design more minor ticket scholarships, and girls to access these with the help of local grassroot NGOs or other last mile organisations.

The open network can solve suppliers' existing problems of validating the eligibility of the students for scholarships by integrating the Government's data of students (enrollment in school, longitudinal academic history of the student, income levels, etc.). At the same time the Last Mile Organisations can not only validate the student's credentials for relevant scholarship but would also be able to access and match available scholarships through the Open Network Ecosystem. The donors can partner with the private and public scholarship providers or directly upload the scholarships specifically designed for girls pursuing STEM education.

At the same time, having a DPI like ONEST will also solve the high transactional cost of providing small ticket-size scholarships and loans. It will build the trust of several scholarship/loan providers and help increase the scale of the already existing platform in this domain, enabling the reach of available scholarships to students like Scholarify or Buddy4study.

At the same time, **innovative financial instruments** such as income-sharing agreements, crowdfunding and blended finance initiatives can offer alternative funding mechanisms to enhance student support. For example, philanthropies could put up collateral to subsidise the cost of loans.

The open network will streamline scholarship distribution, bridging the gap between available funds and student needs, while fostering collaboration among diverse stakeholders to maximise support, especially for girls. Here are some envisioned values of the open network for different stakeholders.

Supply side factors

1. **Scale and impact:** Joining the platform will allow stakeholders to scale their scholarships and reach thus enhancing the impact by harmonising efforts, breaking down silos, and maximising reach and effectiveness through collaboration within an open network.
2. **Streamlined delivery:** Using technology will reduce the time and complexity of scholarship disbursal. The platform can facilitate the government's delivery and monitoring of scholarship budgets.
3. **Reduced frictional costs:** It will enable the distribution of small scholarships without high transaction costs.
4. **Gender-intentional support:** The network can prioritise scholarships targeted explicitly at girls pursuing STEM, facilitating the creation of gender-intentional financial products.

Demand side factors

5. **Streamlined access:** Will simplify finding and applying for scholarships and financial aid.
6. **Building community relevance:** The platform will enable last-mile organisations to identify the most relevant scholarships for their communities and raise awareness of available products through targeted outreach.

Open Network Ecosystem for Scholarship Enablement for Girls Pursuing STEM Education

This ecosystem aims to streamline access to scholarships and financial aid, making it more accessible for girls pursuing STEM education. An Open Network will ensure that financial resources effectively reach the intended beneficiaries. An open network approach that integrates public scholarships, private financial instruments, and philanthropic efforts into a cohesive platform will deliver value at scale

Existing Solutions			
Government Scholarships	Private Scholarships	Private Platforms	Open Network
VidyaSaarathi BEGUM HAZRAT MAHAL NATIONAL SCHOLARSHIP	STEM Stars An Infosys Foundation Scholarship for Girls KOTAK KANYA SCHOLARSHIP 2023 Opening Gateway to your Dreams For Young Women in Science L'ORÉAL INDIA	Buddy4Study Gateway to scholarship world	ONEST

Role of Various Stakeholders				
Supply Side Stakeholders			Demand Side Stakeholders	
Government	Scholarship Providers	Donors	Schools	CSOs
• **Provide data for validating student credentials** -academic performance, income levels, social background, etc. • Integrate and ensure interoperability with other government platforms	• Design STEM specific scholarships for school girls with low transaction costs • Partner with donors and enable awareness and reach • Reduce friction cost and time taken for the delivery of scholarships to the students	• Access the platform to provide for Gender intentional scholarships and financial support at scale • Creare active engagement and feedback critical for further refinement • Streamline the delivery	• Act as information and access points for the network, facilitating applications • Provide necessary academic records and performance metrics for scholarship applications	• Validate student's credentials • Last-mile delivery and support, especially in rural and remote areas • Raise awareness and uptake. targeted outreach of relevant scholarship for potential beneficiaries through own networks

Recommendation 2: Building a Digital Public Infrastructure for Career Guidance and Mentorship

In the domain of career guidance and mentorship (CGM), there is a huge focus of existing programmes on urban areas and jobs in the organised sector, rendering them less relevant for rural students, particularly girls, seeking information on local opportunities. A significant challenge lies in the availability of local role models who can motivate girls to aim for careers in STEM. Several challenges that impact access to career guidance and role models for girls can be identified from the demand and supply sides.

Demand-side challenges

1. Lack of access to career guidance during the middle and high school stages (girls' decision to pursue science disciplines gets established in this age group).
2. Poor visibility of relatable role models, pursuing careers in science streams in girls' vicinity.
3. Available information is regarding urban city jobs, which come with mobility challenges.
4. Lack of mentors to help them navigate their day-to-day challenges and aspire for a career in STEM-related jobs.

Supply-side challenges

1. Scalability is a big challenge for career guidance service providers. Reaching the large user base to share local opportunities with the end users..
2. It is difficult to reach students outside the schools. Schools don't have dedicated periods for girls/students to access career guidance.
3. Lack of understanding of local and contextual challenges the girls face to seek career/ higher education opportunities after school.
4. Lack of local mentors and logistical challenges to connect the right mentor and the mentee.

A Digital Public Infrastructure (DPI) effectively enhances accessible and relevant career guidance and mentorship, particularly for girls residing in non-urban areas. By facilitating collaboration between diverse stakeholders like the employment providers, career guidance providers, education providers with education and career seekers to enrich content, DPI aids students in identifying local career opportunities and deriving benefits.

This infrastructure has transformative potential, connecting career guidance providers/ mentors from various locations with students transcending geographical barriers. It fosters convergence among individuals, educational institutions, employers, private career guidance providers, NGOs and government agencies, facilitating the sharing of valuable insights, resources, and expertise. Additionally, the platform supports mentorship programs, networking events, and collaborative projects, empowering users to navigate their career trajectories confidently and effectively.

The DPI facilitates employer onboarding from the community, providing information on local career opportunities. Stakeholders such as mentors, career counsellors, and local NGOs can

validate and inform students about the authenticity of these opportunities. An open network allows Knowledge Organizations to utilise the DPI to expand the outreach of available opportunities and relevant career options to a more extensive student base. Furthermore, it facilitates mentor-mentee connections at state, district, block, and cluster levels, ensuring access to information and guidance from trusted sources. At the block and cluster levels, local employers, career guidance providers, mentors, and NGOs can act as catalysts in motivating girls to complete their school education and pursue subjects offering future career opportunities. Moreover, the DPI can enable successful women from similar communities residing in different geographic areas to connect with students, act as relatable role models, and foster aspiration among girls.

Here are some envisioned values that the recommendation holds for different stakeholder:

Supply side factors

1. **Scalable and sustainable model:** The digital infrastructure's design for scalability will ensure that effective CGM reaches a broad audience, supporting long-term sustainability.
2. **Career guidance providers:** Career guidance providers find it hard to reach remote area students and understand the local opportunities and guide students especially girls who face mobility challenges. The DPI will provide the much needed platform and enable oportunities to understand and explore regional jobs.
3. **Inclusive economic development:** Tailoring career guidance to local contexts will foster inclusive economic development, providing girls with pathways to contribute meaningfully to their communities.
4. **Mentor-Mentee connect:** Enabling the correct connection of the mentee with the mentors.

Demand side factors

5. **Empowerment through Representation:** By providing access to female mentors in STEM, the platform can empower girls by exposing them to **role models** who exemplify the possibilities within these fields and incorporate diverse perspectives and local nuances.
6. **Enhanced Career Support:** It can enable students to discover a mentor, or coach based on their specific needs & goals as per their respective career graph. Enabling students and teachers to access STEM-focused career guidance resources, will help in bridging the gap in educational support.
7. **Aligning career aspiration with job fit:** Employers find it difficult to get the right fit for their roles and face attrition related challenges. The DPI will support in bridging the talent gap and reducing attrition for employers. It also holds promise in facilitating the alignment of job requirements with individual aspirations by facilitating an optimal match between job seekers and available positions.

The initiative to build Career Guidance and Mentorship-led Digital Public Infrastructure will democratise access to career information and mentorship, particularly for girls in STEM. By leveraging local insights, fostering stakeholder collaboration, and integrating resources digitally, this infrastructure promises to enhance educational support, empower student

communities, and promote inclusive economic development. Its implementation can significantly alter the landscape of career guidance, making STEM fields more accessible and appealing to girls across diverse regions, thereby contributing to a more equitable and diverse future in STEM careers and beyond.

Digital Public Infrastructure (DPI) for Career Guidance and Mentorship (CGM)
This DPI aims to provide a unified platform to address the current gaps in career guidance and mentorship, particularly for girls outside urban centres and in sectors beyond the organised job market. It seeks to make local, contextual job information and mentorship accessible, leveraging technology to reach a wide audience and ensuring scalability.

Existing Solutions			
School-Focussed	College-Focussed	Community-Focussed	Open Network
CLAYLAB, antarang, DREAM A DREAM, ALOHOMORA unlocking minds	mentor together, medha, masai	Pratham InfoTech Foundation e-education for all, breakthrough, sard, FREEDOM ENGLISH ACADEMY, साझे सपने | SAJHE SAPNE	ONEST

Role of Various Stakeholders				
Supply Side Stakeholders			Demand Side Stakeholders	
Government	Knowledge Organisations	Local Employers	Schools and Students	Last Mile Organisations
• Policy support, funding, safety regulations for online interactions • Integrate and ensure interoperability with other government platforms	• Career guidance providers get exposure to regional job opportunities and thus are able to generate aspiration towards them • Create awareness of new job roles • Connect the right mentors with the mentees leading to the right fit between the demand and supply	• Get opportunity to share the available vacancies with local talent. • DPI will enable collaborations with career guidance providers and help get the right talent and reduce attrition problem	• Freedom of choice will be available to the students and teachers to select the jobs from a surplus pool of providers of their choice as per their preferences in terms of jobs, location, and affordability. • Access to job ecosystem	• Access & broadcast reliable content on the DPI • Last-mile support services to help students to understand and access credible jobs • Create mentor/ mentee connect • Enable exposure to the role models from their own community

Recommendation 3: Constructive Action with Community for Shifting Gender Norms on STEM

Social biases perpetuate the confinement of girls to traditional household roles, contributing to the undervaluation of their potential in STEM fields. Prevailing stereotypes and cultural expectations further reinforce the notion that girls are inherently less inclined or capable in STEM subjects compared to boys, discouraging their pursuit of STEM education and careers. Addressing these biases through community-participative programs is imperative for empowering girls and fostering their equal participation in STEM. Primary interviews underscored the positive impact of parental awareness and involvement on student effort and learning outcomes. However, existing community-level initiatives aimed at shifting gender norms face scalability limitations. To challenge perceptions and showcase girls' proficiency

in STEM, an integrated scalable movement is proposed, enabling girls to demonstrate problem-solving skills through addressing local issues such as solid waste management or clean drinking water availability. This can be approached with simple initiative taken by the grassroot NGOs in collaboration with Local bodies/Panchayat, highlighting a few local challenges (for eg. solid waste management, availability of pure drinking water etc.), providing lean guidelines for the event where the community will witness school girls using their STEM capabilities solving for the local challenges. This action to be followed across all the Zila Panchayat's, aggregating it to the state and national level, thus enabling the community and parents to witness girls' ability to do science and bring solutions to local problems thus building the sense of pride in parents towards their daughters. This will enable a shift in the parents' mindset towards girls in STEM education and STEM careers.

For fostering a supportive environment for girls' participation in this national event, the following steps can be considered to ensure seamless execution:

1. **Event Execution Time:** Local NGOs, in partnership with the local government, can align on the time of the year most suitable to conduct the event (a week to 10 days).
2. **Problem Selection:** The challenges which impact more than 70% of the population can be chosen by the local government and NGOs as the problem statement for the event, in order to ignite girls' motivation and interest in participation.
3. **Event Rollout:** Girls from the community to be invited to work on solving the problem, through existing communication channels like schools, panchayat meetings, social media and so on.
4. **Community Recognition:** Immediate acknowledgement and rewards for the best solution leading to mass recognition of the effort which gets aggregated at the state and the national level. Thus leading to generating stories across the nation of how girls are applying STEM skills to solve social problems. Thus leading to the mindset shift.
5. **National Recognition:** Innovative and winning ideas can be showcased on a national platform to motivate and encourage more participation.

This recommendation can catalyse transformative value across various dimensions for communities, girls in STEM, and the broader ecosystem of education and gender equity. Here are some envisioned values that emerged as an outcome of our workshop:

1. **National Movement for Gender Equity in STEM:** The initiative will build a collective movement that amplifies the importance of girls in STEM, showcases their contributions at local platforms that get aggregated on a national platform, and will encourage the replication of successful models across districtst.
2. **Empowerment and Inclusion:** Providing a platform for girls to showcase their STEM skills can empower them, promote inclusivity, and introduce them as role models to the community. It will challenge and shift ingrained gender norms surrounding STEM education and careers, inspiring girls to participate and excel in STEM-related activities.

3. **Community Engagement and Development:** The involvement of local governance bodies, NGOs, and community stakeholders in addressing local challenges through the initiative will ensure that solutions are community-driven and have a tangible impact.
4. **Innovation and Problem-solving:** Encouraging girls to apply computational and critical thinking to solve local challenges will foster a culture of innovation. It will demonstrate the practical applicability of STEM education and encourage a problem-solving mindset among participants. Showcasing these skills will enable trust building in parents towards their daughter's capabilities.
5. **Parent's Mindset shift towards girls' STEM education:** The primary outcome of these nationwide events will be a significant shift in parental attitudes toward girls' education and careers in science, thereby catalysing a mass movement aimed at challenging and ultimately dismantling prevailing gender stereotypes that influence girls' career decision-making processes.

Constructive Action with Community on Shifting Gender Norms on STEM
This aims to ignite a shift in gender norms relating to STEM within local communities. By engaging community stakeholders, it encourages the active participation of girls in solving local challenges through analytical thinking and innovation. Local governance bodies ensure recognition and support for these innovations, creating a pathway for them to scale up at to a national level.

Existing Solutions	
Top-down Approach with Local Bodies	Bottom-up Approach with Parents & Community
aProCh | Making our cities Child Friendly A Protagonist in every Child Akshara Foundation EVERY CHILD IN SCHOOL AND LEARNING WELL	Nanhi kali Where girls learn they matter FAT Feminist Approach to Technology Milaan Building a movement of Girl Leaders

Role of Various Stakeholders			
Government	Schools & Local body	Grassroot NGOs/CSOs	Parents
• Executional guidelines to be sent to local governance bodies and stakeholders like NGOs, Youth volunteers for national-level involvement • Building recognition and incentivisation model	• Facilitate girls' access to community campaigns • Ensure internal recognition models to incentivise girls' participation • Motivate the community to enable girls' participation and to own the event in their village	• Ensure community platforms/programmes for visibility of girls' innovation and efforts • Last-mile delivery and support, while providing necessary guidance to girls and parents • Run awareness campaigns	• Own and participate in the event and enable their girl's participation as well • Witness the event and facilitation of girls in their village • Undergo a transformation to understand the gender barriers restricting the girl's career growth and aspiration

Recommendation 4: Leverage Assessments to Enable State Action in STEM Skills for Girls

As the Government pushes forward initiatives aimed at enhancing life skills among students, a critical gap emerges in their execution. Existing life skills programmes often lack data-driven decision-making. Unfortunately, these programmes neglect the influence of gender stereotypes, particularly impacting girls' ability to develop life skills. This oversight creates additional barriers to fostering girls' interest and proficiency in STEM subjects. Moreover, existing interventions fail to adequately empower girls to navigate gendered norms, limiting their ability to make decisions for better future prospects. Therefore, there is a need to generate large-scale evidence for the development of gender-informed life skills programmes.

While there is a growing awareness and willingness among state governments to focus on building these life skills, there is limited evidence to guide an intentional gender-based life skills curriculum. The efforts of states looking to create such programmes should be supported with rigorous data generated by scientific assessments. It is critical to build partnerships with institutions and organisations implementing large-scale life skill assessments which can provide data to inform gender-specific curriculum guidelines. Institutions like PARAKH and Life Skills Collaborative can lead the initiative to enable the scaling of assessments at district and state levels. Feedback loops with the data can be generated to make decisions about gender-specific curriculum design and development.

To fully support girls in pursuing STEM education and careers, this assessment must be carefully designed and implemented. The assessment can integrate the following elements:

1. **Skill Selection:** Established frameworks on life skills and STEM competencies, as recommended by entities such as UNESCO, can be utilised to cover recognised essential skills. The focus can be on specific skills that align with the changing industry requirements and empower girls.
2. **Comprehensiveness:** The assessment can be practical and application-based, taking a step beyond traditional survey methods and enabling a real understanding of a student's capabilities.
3. **Context-specificity**: It can be tailored to reflect state, local, and cultural contexts. This will ensure that it is relevant and respectful of the diverse backgrounds of students.
4. **Technology Integration:** Learning Content Management Systems from the foundational years can be used to support varied learning styles and needs.
5. **Language and Inclusivity:** Technology can be used to make the tests accessible to all students, ensuring that differences in language proficiency do not hinder participation.
6. **Streamlined Delivery:** State education boards and technology partners can be onboarded to support skill assessment. This will minimise errors and simplify the process for students, educators and the governments alike.
7. **National Implementation:** The final goal can be to roll out the assessment as a nationwide initiative. This will ensure uniformity in how STEM skills for girls are assessed and recognised across the country.

By identifying which life skills are essential for building agency and fostering STEM skills, policymakers and educators can make more informed decisions regarding intervention strategies, ultimately fostering greater gender equity in STEM education and career pathways. Here are some envisioned values:

1. **Evidence Generation on Life Skills for Girls:** Collaboration with institutions like PARAKH and Life Skills Collaborative can help in building large-scale life skill assessment tools and using these tools to generate data and guide decisions to improve classroom efficiencies.

a. **Use of data to inform gender-responsive curriculum design:** Insights from the assessments can be leveraged to develop curriculums that address the unique life skills gaps faced by girls and deliver gender-responsive STEM education.

b. **Use of data to inform teacher training and pedagogy designing:** The assessment can inform teacher training and pedagogy by identifying specific areas where students may need additional support. Training of teachers and pedagogical approaches can be tailored to address these identified needs.

2. **Monitoring and Evaluation:** The assessment can aid in monitoring the effectiveness of the gender-responsive curriculum by capturing the change in performance of girls over the years.

In conclusion, addressing **gender-specific** challenges in STEM education requires ecosystem-level solutions aimed at dismantling stereotypes and empowering girls to pursue STEM careers. By providing avenues for girls to challenge stereotypes and shifting parental mindsets toward STEM careers, girls' uptake of STEM education can be enhanced. Additionally, open network platforms offering financial aid and career guidance can effectively tackle **gender-accentuated challenges.** It is imperative to implement large-scale interventions at the ecosystem level to overcome these challenges and ensure that millions of girls have equal opportunities to thrive in STEM fields. Through concerted efforts at various levels, a more inclusive and supportive environment for girls in STEM can be created, paving the way for their success and contribution to innovation and progress.

Leverage Assessments to Enable State Action in STEM Skills for Girls
Implementing large-scale life skills assessments, in collaboration with entities like PARAKH to gather data can informs the development of gender-specific curriculums. This initiative will bridge the existing gap in life skills among girls by fostering an educational ecosystem that supports their journey in STEM fields, ensuring the curriculums are evidence-based, scalable, and directly address the needs of girls.

Existing Solutions	
Government Entities	Non-Government and Private Entities
parakh;	Breakthrough; Pratham InfoTech Foundation e-education for all; QUEST ALLIANCE; Life Skills Collaborative; Room to Read

Role of Various Stakeholders					
Government (Central & State)	Technology Partner	Students	Schools	Industry & Research Institutions	Civil Society Organisations
• Policy making, funding, infrastructure • Design and conduct the life skills assessment	• Platform development • Data collection and analysis	• Take part in the life skills assessment • Engage with and provide feedback on the curriculum	• Provide students the infrastructure to take the life skills assessment • Implement the curriculum, teach the new gender-responsive curriculum	• Provide insight and practical exposure including internships and real-world STEM applications • Supply inputs on the assessment and curriculum design	• Last-mile programme support

Annexure A

Case Studies in Advancing Gender Equality in STEM

A total of 23 organisations were approached for this study to understand the varied solutions provided for the gender-agnostic, gender-accentuated and gender-specific challenges impeding the uptake of STEM education by girls.

Details of the programmes and the problems these organisations are solving can be found here.

Name of the Organisation	Gender-Agnostic					Gender-Accentuated			Gender-Specific			
	STEM Mindsets	Teacher Capacity	Access to Infrastructure	Curriculum Reforms	Assessment Methods	Financial Resources	Career Guidance	Access to STEM subjects	Community Engagement	Exposure to Role Models	21st Century Skills	Resolving Teacher Bias
Aavishkaar Yaatraa		■										■
Agastya Foundation		■	■			■			■			■
AISECT											■	
Akshara Foundation		■							■			
Alohomora							■					
AP Government		■	■			■		■			■	
Atal Tinkering Labs	■		■								■	■
Avanti Fellows				■		■			■			
Buniyaad		■	■						■			
DIKSHA Platform			■									
FAT	■		■						■			
FILO		■										
IBM STEM for Girls	■	■				■				■		
Khan Academy		■		■	■							
Lend a Hand India							■					
MASAI School						■		■			■	
Milaan Foundation									■		■	
Nanhi Kali			■	■					■		■	
NavGurukul						■	■	■			■	
OLabs			■									
Quest Alliance		■				■	■		■	■	■	
Sajhe Sapne							■	■			■	
Tech Mahindra		■	■								■	

Gender-agnostic Solutions

Aavishkaar Yaatraa: Improving Classroom Practices through Teacher Training

Solution Offered

Aavishkaar runs **teacher capacity building programmes** (residential, online and in-school) based on three pillars:

Developing conceptual clarity: The modules used connect concepts to everyday examples and research-based content.

Building teaching methods: Works with teachers to build engaging teaching methods which support visualisation of concepts.

Changing mindsets of teachers: Through experiential sessions, facilitator works towards a shift in mindsets around maths and science.

Sustainability & Scalability

Partnerships: Collaborates with state governments to reach out to more schools and teachers. It is working on integrating its modules within the state's curriculum.

Cross Subsidising Costs: Subsidises costs by securing funding from government or usings excess funds from its paid programmes, allowing them to offer discounted or free training programmes to educators.

Leveraging the Internet: The organisation offers online training modules and resources, facilitating remote collaboration among educators, thereby widening its reach and providing flexible learning opportunities.

Gender Focus

Women Math Educator Programme: Girls who are out of the school system are provided a one-year immersive programme (available in online modules as well) to make them STEM educators.

Special Camps for Girls: Runs residential camps in school & at their own campus for female students, while ensuring that examples of relatable women scientists are used with careful use of language. 90% of the teaching staff at Aavishkaar is female.

Impact

2,00,000+ students impacted

10,000+ teachers trained

75 schools/ organisations

4 state governments

Agastya Foundation: Ensuring Access & Quality of STEM infrastructure

Solution Offered

Access to STEM Labs: The incorporation of hands-on learning through science centres, mobile labs, and lab-in-a-box programmes provides girls with a tangible connection to scientific principles.

Teacher Training: Provides teacher training through creative learning methods, focusing on making STEM education more engaging and effective, particularly in government schools where resources may be limited.

Community Engagement: Activity involves the community in the learning process through community night visits, science fairs etc that encourage parental support and involvement.

Sustainability & Scalability

Technology Integration & Open IP Model: Incorporated digital learning platforms and initiatives like Acti-Learn & We-Learn. Maintains an open IP approach, sharing resources with like-minded organisations.

Partnerships and Volunteer Mobilisation: Collaborates with state governments, government schools and low-cost private schools, leveraging existing infrastructure. It actively mobilises volunteers to contribute their time and skills.

Gender Focus

Young Instructor Leader Programme: Trains girl to become peer instructors & role models, which enhances their subject-proficiency & develops leadership skills.

Scholarship Programme: Supports talented girls from economically deprived backgrounds until they complete their master's degrees.

Comprehensive Module on Gender Sensitivity: Outlines best practices for facilitators during sessions along with 20 days of annual trainings.

Gender-focused policies: A gender ratio of 45:55 (girls: boys) is maintained, examples of women scientists are given, priority is given to girls to participate.

Impact

25 million students across 23 states

3,00,000 teachers

95+ science centres

160+ mobile labs

AISECT: Building Aspirations through Skill Development

Solution Offered

Skill Development Programmes: Class 9th-12th students from arts and commerce backgrounds in rural and semi-urban areas are offered short & long term trainings, aligned with the national skills qualification framework.

Practical Exposure: Hands-on experience for students through guest expert lectures, industry visits and on-the-job training.

Embedded Life Skills Modules: Integration of personality development and English modules in trainings such that the students are able to face interviews confidently.

Sustainability & Scalability

Franchise Model and Marketing: 2,000-3,000 franchise centres are established each year and connected to AISECT academies to enrol students.

Low-Cost Courses: In the NSQF programme, the cost is borne by the government. For paid courses, costs range from ₹2,000 to ₹10,000 based on course duration, along with a provision for students to pay in monthly instalments.

Funding from NSDC: Funds from the National Skill Development Council are utilised to foray into new areas, like existing expansion in North-East & South India.

Gender Focus

Dedicated Female Batches: The programmes and courses run dedicated female batches to create a conducive environment for female engagement.

Counselling and Support: The programmes have female counsellors & girl mobilisers, which ensures increased comfort and confidence among girls.

Flexible Timings: The classes are arranged in the morning and afternoon hours and during the weekend, if students miss any classes.

Impact

3,54,500+ students in 28 states & 6 UTs

48.6% female students

29 academies supporting 31,130 franchises

Akshara Foundation: Leveraging Community Engagement to Drive Learning Outcomes

Solution Offered

Community Engagement: Gram Panchayat contests are conducted to evaluate children's current maths learning levels while ensuring buy-in and involvement of community members including parents, panchayats, SDMC members, etc.

Teacher Capacity Building: Training and field support provided to teachers, state and district Resource Persons (RPs) in the education department, along with free online course on the DIKSHA platform & 25 hours+ teaching learning videos.

GKA Maths Kit: Maths kit containing materials like abacus, protractor, play money notes, concept cards etc provided with teacher's manual to facilitate learning.

Sustainability & Scalability

Building Blocks Learning App: Developed free app to help children practice maths concepts anywhere and anytime, as a set of fun games both online and offline.

Partnerships and Volunteer: Government-led contest implementation, backed with financial investments and commitment from community members. Local youth volunteers leveraged for community engagement network.

Impact

92,000+ schools

2,00,000+ teachers trained

50,000+ education volunteers

7 million+ Children (grades 1-5)

Andhra Pradesh Education System: Ensuring Access to Finance & Infrastructure

General Schemes & Policies

Budget Allocation: The Andhra Pradesh Government allocated 31,198 crores to general education, which amounts to 16.87% of the total budget.

Jagananna Amma Vodi Scheme: Launched to encourage parents to send their children to school by depositing ₹15,000 as financial aid in the bank account of student's mother.

Mana Badi-Nadu-Nedu scheme: Attempts to modernise schools in the state with 10 components of infrastructure, including additional classrooms, maintenance of toilets, English labs and kitchens, green boards etc

Jagananna Vidya Kanuka scheme: The government provides school kits to children consisting of two pairs of school uniform, textbooks, notebooks, dictionary, school bag, belt, a pair of shoes and one pairs of socks.

STEM-focused Schemes & Policies

Jagananna Vasathi Deevena (MTF): This provides ₹10,000 per person to ITI students, ₹15,000 per person to Polytechnic students, ₹20,000 per person for other degrees & courses per year to eligible student for food & hostel expenses.

Digital Devices: 5,18,740 tabs were distributed to Class 8 students and teachers in the AY 2022-23. 30,213 IFPs were installed in classrooms from Classes 6-10 & 10,038 Smart TVs in foundational schools.

Training for use of ICT devices: 4,000 school complexes were mapped with 394 engineering colleges to extend training support. The engineering students train the students and teachers in use of technology in the classroom as part of internships.

IIIT Admissions: Students are provided admission to IIIT based on class 10th results and a deprivation score of 0.4 is added to the GPA of socio-economically challenged applicants who studied in non-residential government schools.

Atal Tinkering Labs: Developing STEM Mindsets

Solution Offered

Improving Lab Infrastructure: Allows students to get hands-on experience and learn innovation skills. ATLs contain DIY learning kits and equipment for robotics, sensors, 3D printers and computers.

Exposure Activities: Conducts different activities at periodic intervals ranging from regional and national level competitions, exhibitions, workshops on problem solving, designing of products, lecture series etc.

The ATL Tinkering Curriculum: Enables students to understand a variety of STEM concepts like basic electronics, data visualisation, and emerging technologies such as IoT and design thinking.

Impact

Monitoring and Evaluation: ATL Sarthi provides tools and support to schools to adopt a self-monitoring method through a cluster approach, performance enablement framework, MyATL Dashboard and SOPs to ensure financial & non-financial compliances.

10,000+ Atal Tinkering Labs

1.1 Cr+ students engaged

6,200+ mentors of change

16 lakh+ innovation projects created

DIKSHA Platform: An Unified Platform for Educational Resources

What is the DIKSHA platform?

DIKSHA (Digital Infrastructure for Knowledge Sharing) is a national platform for school education that provides quality in States/UTs and QR coded Energised Textbooks for all grades (one nation, one digital platform).

Features of the DIKSHA platforms

QR Code: National digital infrastructure for teachers and students can be accessed after scanning the QR code provided in NCERT books.

Languages: The portal is accessible in English and varied languages that include Hindi, Marathi, Tamil, Telugu and other 18 languages.

Location-Based: It offers a list of courses based on students' location from which they can choose any as per their skill set.

Class-Based: Offers study material based on the class chosen to access by the user.

Mobile Application

Mobile Application: It is available on mobile for android and iOS users, for teachers, students and parents. The app is loaded with engaging learning material that fits the needs of prescribed school curriculum.

Benefits of the Mobile App

For Teachers: Offers access to lesson plans, worksheets and activities, to create enjoyable classroom experiences and guidance to understand their career span.

For Students: Offers easy and interactive features to revise lessons and facilitates self-evaluation students' learning through self-assessment practice exercises.

For Parents: Parents can follow classroom activities and clear doubts outside school hours, using this comprehensive platform for hassle free interaction.

FILO: Providing Instant Access to Teachers

Solution Offered

Instant Tutoring: Filo Instant, with its 24/7 access to live teachers, helps bridge learning gaps by providing personalised assistance to students when they need it the most.

Live Online Classes: Filo Classroom offers live online classes so that students have access to high-quality instruction, levelling the playing field for students in remote locations.

Personalised Learning Paths: Filo uses adaptive learning technologies that tailor content to the individual learner's needs.

Sustainability & Scalability

Using Digital Platforms: Reduces the need for physical resources by automating processes required for implementation of the programme, making it easy to adapt to aspects like language, social & geographical environment.

Cost-Effectiveness: Offers different subscription or pricing models to cater to various socioeconomic backgrounds. Students can purchase talk time with teachers for as low as a few minutes bringing the ticket size under ₹50.

Gender Focus

Empathy-Driven Pedagogy Training: Promotes gender sensitivity by training tutors such that the inclusive learning environment is ensured for all irrespective of their gender.

Availability of Female Tutors: Makes sure that female tutors are available such that girls view them as relatable mentors in STEM, which aids in breaking down any gender-related barriers.

Impact

35 lakh students served across 15 countries

60,000 teachers on the platform

70,000 live classes take place everyday

Khan Academy: Supporting Learning Practices through Tech Enabled Solutions

Solution Offered

Engaging Free World-Class Content: Offers practice exercises, instructional videos and personalised learning dashboard, which ensures studying at one's own pace, in and outside of classroom.

Skill-Based Learning: Each course is broken down into 70-120 skills, allowing the students to dig into skills where they need support or skip ahead when they show proficiency.

Teacher Assistant: In-built platform features used by teachers to assign homework, provide targeted practice to students and monitor progress using the real time dashboards.

Sustainability & Scalability

Low Cost of Operations: The per-student cost varies between ₹100-400 depending on the scale in different regions. A team of ~30-35 members leverages tech enabled innovative structures to run operations in India.

Partnership with State Governments: Wherein the State government ensures availability of infrastructure (devices and internet) in schools, appoints a cadre at district/block level to support teachers & monitors the goal's progress.

Leveraging AI: KhanMigo, a transformational AI tutor for teachers, students and administrators, will be introduced in some of the partner schools for academic year of 2024-25.

Gender Focus

Gender-Agnostic Programme: When creating content, for example, it is ensured that it is contextual for mix of boys and girls.

Working with KGBVs: Working in 746 KGBVs across 73 districts in UP, impacting 80,000 girls from Grades 6-8. Replication is being considered for Maharashtra.

Impact

10
Schooling systems across 7 states/UTs

8.4 million
students registered on the platform

1.2 million
government school students learning maths & science

OLabs: Providing Access to Labs through an Online Medium

About

OLabs offers high-quality online labs for Science, Maths, and English. The labs designed for classes 9 to 12 are aligned with NCERT and SCERT. The OLabs are hosted at www.olabs.edu.in and its access is free for schools upon registration.

Languages: Currently, it is available in five languages: Hindi, Kannada, Malayalam, Marathi, and Tamil.

Sustainability & Scalability

Vast Coverage: At present, 170+ Physics, Chemistry, Biology, Mathematics and English experiments, covering topics like Hooke's law, area of triangle, tense conversion, etc. are available online.

Usage: Each Lab comprise sections covering "Theory", "Procedure", "Animation", "Simulation", "Viva-Voce", etc. It Includes features such as recording observations, plotting graphs, etc which enhances the overall learning experience.

Gender-accentuated Solutions

Tech Mahindra Foundation: Developing STEM Infrastructure & Skilling the Youth

Solution Offered

Mobile Science Labs: Buses visit primary government schools as a traveling laboratory to facilitate learning of students from Class 3 to 5.

Skilling: SMART academies offer advanced and long-term courses to develop industry specific skills while SMART centres provide employability skills training.

Teacher Training: Teacher capacity building programmes are run using highly qualified teacher educators, well-structured workshops, seminar halls, fully-equipped ICT labs and resource centres for professional development.

Sustainability & Scalability

Partnerships: Actively collaborates with stakeholders like corporates, other NGOs, teachers, students etc to reach out to more communities through 150+ projects.

Monitoring and Learning: They have stringent internal review mechanisms like innovative M&E frameworks and assessments to ensure sustainability and track delivered impact.

Impact

1,56,748 youth trained in SMART academies

49,409 teachers trained

34 courses offered in SMART academies

6,000 students reached through mobile labs

Alohomora Foundation: Supporting STEM Aspirations through Career Guidance

Solution Offered

Career Guidance: Provides a 5-step career exploration and planning framework that offers exposure, agency, and confidence to make informed career decision.

Stakeholder Collaboration: Collaborates with teachers to host career exploration activities, peer discussions & role model interactions.

After School Support: Offered to students who have completed their Class 12th, open to further education and skilling opportunities.

Sustainability & Scalability

Youth-led Programmes: Facilitated by local community youth, making the programme more relatable for students by tailoring it to their contexts.

Tech Portal: Runs a unique tech portal, which is a repository of resources with wide-ranging career options and structured career courses.

Government Collaboration: Collaborates with state & district governments to reach students at scale, through teacher manuals & printed career exposure resources.

Gender Focus

Female Role Models: 80% of the students in the programme are girls, with focus on highlighting female role models in various careers through case studies, videos and other printed career resources.

Reshaping the Narrative: Spotlight is thrown on non-traditional approaches to career choices, for example, highlighting male fashion designers or female IT professionals.

Impact

5,000+ students influenced through own facilitators in past 5 years

400+ teachers impacted, reaching 20,000+ students over 2 years

60% students reported a shift in confidence to make career choices

Avanti Fellows: Strengthening Classroom Practices & Community Engagement

Solution Offered

Class IX & X

Foundation Classes: Extends foundational courses in maths and science, career guidance sessions, role model interactions and parent counselling. High priority employability skills and STEM clubs are other initiatives in pipeline.

Class XI & XII

Test Preparation: Provides JEE and NEET exam coaching to government school students free of cost, along with guidance on exam preparation, stress management, college and career selection.

Sustainability & Scalability

Leveraging the Internet: 70-80% of the students are taught through an online medium via live classes and asynchronous learning material such as videos, along with online tests and assignments.

State Government-led Model: Plan to increase the no. of schools under operation via state government partnerships and state-by-state scaling model.

Use of Artificial Intelligence: Exploring ways to use AI to deepen engagement levels in its online programme via personalised feedback, adaptive assistants to train students on test-taking strategies.

Gender Focus

Gender-Sensitive Approach: Social and emotional learning-based maths and science methods, trained facilitators to support female students and incorporation of real-life examples relevant to girls, are included.

Parent Counselling: Parent-Teacher Meetings are used to counsel parents on information asymmetry about JEE-NEET and value of higher education for girls.

50-100% Female Teachers: 50-100% teachers in the offline and online batches are females, to establish role models and relatability for girls, thus creating a safe space.

After School Activities: Girls are selected for summer camps and provided hands-on exposure. The Girls Leadership Programme improves 21st century skills.

Impact

1,600+ students impacted through foundation programmes

4,350+ students provided test preparation

1800+ students placed in top-tier STEM colleges

Lend a Hand India: Offering Internships & Vocational Education

Solution Offered

Internship Opportunity: Provides internships to class 11th and 12th students with MSMEs (like financial services, auto workshops etc) close to their schools or homes with typical clock time of 80+ hours.

Focus on Vocational Education: Collaborated with state governments to set up project management units which ensure integration of vocational training to enhance applied learning outcomes, according to the NCF and NEP.

Sustainability & Scalability

Supporting Atal Tinkering Labs: Working in partnership with NITI Aayog in schools to train educators using ATLs, with one engineer mapped as an intern to every school for implementing hands-on learning in these ATLs.

Impact

1,00,000+ skill trainings facilitated

10,000+ students impacted in 150+ schools directly

1 million+ students impacted in 10,000+ schools indirectly

Masai School: Developing Digital Skills & Providing Innovative Financing

Solution Offered

Intensive & Immersive Learning: The programme, spanning across 6 months, ensures holistic development to match industry demand across skills like coding, communication, soft skills development, maths and interview preparation.

Pay after Placement Model: Students do not pay any fees during the course. After securing a job offer with an annual CTC of over ₹3,50,000, the students pay a course fee of ₹2,50,000 in EMIs of ₹6,999 over 36 months.

Sustainability & Scalability

Market-Aligned Curriculum: Scale up strategy involves aligning their curriculum framework and components with market demands.

Commitment to Student Success: Key focus is on developing skills over certifications to ensure meaningful employment for their graduates.

Gender Focus

Counselling & Support: Masai schools have women counsellors and a support team to take care of specific needs of girl students enrolled.

Community Engagement: The team engages with the families of female students to give them confidence about their child's potential.

Impact

4,500+ students graduated and placed

70% students from rural India

> 60% students from EWS background

400 families lifted from poverty

NavGurukul: Building 21st Century Skills & Offering Industry Connections

Solution Offered

Flagship Residential Program: 15-18 months software development program blended with a life skills curriculum for 10th pass students, aged 17 and above.

Providing Economic Opportunities: Samyarth, a services cooperative, hires women and enables profit participation for them. Also offers UTaaS to corporations, enabling risk-free hiring and increasing demand for diverse employees.

Sustainability & Scalability

Meraki App: Students and teachers from low-income schools supported in learning programming, touch typing and English.

Online residential program Zuvy: Offers an online 3-year program where students get a degree and guaranteed jobs.

Alumni-Led Growth: 60% of the team is NavGurukul's own alumni, driving a community-based approach.

Pay Forward Model: Alumni are encouraged to pay for the education of other NavGurukul students once they get a job.

Gender Focus

Girl-Centric Programme: 90% of the total 1,300 seats reserved for women in residential programs. Over 60% team members are women, including the leadership team.

21st Century Skills: The English & twenty-first-century curriculum keeps gender & agency at the centre of the design, with students engaging in workshops & theatre on removing taboos around reproductive agency, community support, etc.

Impact

60,000+ students taught programming through Meraki

700+ students placed through the residential programme

28,000+ marginalised women counselled on STEM opportunities

Gender-specific Solutions

FAT: Developing STEM Mindsets & Engaging the Parents

Solution Offered

Community Jugaad Labs: Girls aged 10 to 13 kindle their interest in STEM through hands-on projects, role model introductions, exposure visits and community exhibitions.

Developing STEM mindsets: Girls aged 14 to 18 year old girls learn to use high-level technical tools (drill machines, 3D printers etc.) to design and create solutions for challenges within their communities.

Community Engagement: Parents are invited as observers, STEM talks & meetings are organised to instil a sense of pride & address safety concerns.

Sustainability & Scalability

Alumni-led Teaching: From 2023 onwards, the Girls in STEM programme is being delivered by Feminist Collectives formed by Young Women Leaders who are themselves graduates of FAT's programmes.

Collectives: Every girl who successfully completes FAT's programmes is supported to start their own collectives. At the end of a 10-year period, FAT sees the experienced collectives becoming independent enterprises with their own sustainability plans.

Gender Focus

Girl-Centric Approach: The entire programme is dedicated to promoting STEM education amongst girls from disadvantaged backgrounds.

Peer Support: A collective-action group for girls to negotiate space for themselves in their community and larger society will also be set up by collectives.

Impact

1,300+
girls skilled from marginalised communities

7 Collectives
set up by 22 young women leaders in 7 states

Areas of Operation:
Delhi, Pune, Buxar, Patna, & Giridih

IBM STEM for Girls: Building STEM Mindsets & Engaging the Community

Solution Offered

Role Model Interaction: Interactions with successful women are enabled to guide students about career pathways and practical decision making.

Exposure to STEM activities: Girls get opportunity to attend immersive workshops, and participate in ideathons.

Teacher Capacity Building: Teachers are provided interactive learning for them to become 21st century facilitators and champion the cause of STEM education.

Sustainability & Scalability

Girl-Centric Programme: The entire programme enables girls to pursue STEM pathways through scholarships, career counselling, creating experiential learning experiences.

PICO Satellite Launch: Training has been provided to girls in satellite, drone and space technology. 135 girls in Uttarakhand and 140 girls in Haryana have been trained.

Gender Focus

Partnerships: Collaborated with NGOs such as AIF & Quest Alliance and with government initiatives like Vigyan Jyoti Scheme & INSPIRE Manak.

Embracing Parent Engagement: Engages with parents as they are the most important stakeholders in their approach.

Impact

2,00,000
girls benefitted through the programme

7,000
teachers will be trained in the upcoming year

$1,86,000
granted in scholarships

Milaan Foundation: Changing Community Mindsets

Solution Offered

Changing Community Mindset: Collaborates with school teachers, ASHA workers, & ANMs for attitude shifts within the community through 1:1 conversations & workshops with fathers & brothers.

Focus on 21st Century Skills: Trains girls on life skills and digital skills which builds their capability to navigate gendered restrictions.

Resource Support: Trained girls act as role model and each Girl Icon is provided with a smartphone and internet data packs to attend the online workshops.

Sustainability & Scalability

Leveraging the Internet: Digital citizenship is a key component of its efforts with online safety sessions being conducted. Integration of technology with the programme ensures scalability w.r.t affordability and broad outreach.

Alumni-led Governance: Girls continue to work in the Girl Icon Advisory Council and programme implementation in the form of Project Assistants.

Partnerships: Engages with the state & district governments, over 100+ community-based & media organisations for last mile outreach. Ensures advocacy such that girls get access to schemes and provisions.

Gender Focus

Girl-Centric Approach: Dedicated to changing community mindsets, removing obstacles that hinder girls' education and development. Adding to this, 85% of the foundation's staff identifies as women.

Girl Icon Programme: As a flagship programme that develops local role models, it plays a pivotal role in reshaping perspectives among men and empowering girls to become leaders and agents of change.

Impact

50,000 adolescent girls educated

1,00,000 girls to be impacted by 2025

2500+ grassroot girl leaders

₹3,600 per student cost of Girl Icon for 18 months

Mission Buniyaad: Enabling Digital Infrastructure to Improve Learning Outcomes

Solution Offered

Developing Digital Infrastructure: Focused on utilisation of ICT infrastructure in schools through setting up of labs and optimal software implementation in non-function labs.

Teacher Capacity Building: Basic computer Instructors were appointed to run the labs and teachers were trained to utilise the ICT infrastructure and build students' proficiency.

Personalised Adaptive Learning: Devices use PAL software integrated curriculum approved by the Government of Rajasthan. Pre-tests and post-tests are conducted to gauge the learning level of girls.

Sustainability & Scalability

Partnerships: Representative of successful collaboration between the Government of Rajasthan, CIFF, Kaivalya Education Foundation (Piramal Foundation), GDI Partners and ConveGenius.

System-Level Change: Programme aligned with each district's and school's agenda and governance. It works to embed improved processes in the existing system including dashboards and data-driven governance.

Gender Focus

Girl-Centric Approach: Objective is to enhance the learning capacity of the students and reduce the gender gap and dropout rate by strengthening digital infrastructure.

Community Engagement: Invited parents and community members to classrooms under the Digi Charcha initiative, to showcase girls using digital devices for learning purposes and to interact with senior government officials.

Impact

3,700+ schools outreached

3,93,000+ girls outreached

1,47,300+ teachers trained

5,00,000+ community members sensitised

Nanhi Kali: Leveraging Ed-Tech & Community Support for Subject Proficiency

Solution Offered

Extended Academic Support: Each girl is provided with a tablet and support from Academic Support Centres in government schools operating 2 hours before/after school.

Leveraging EdTech: Tablets use EI's MindSpark platform which provides content using PAL software for self-paced language, math and science learning assessments.

School Supplies Kit: A kit including a school bag, stationery and a pullover/raincoat is provided to every student along with a 12-month supply of sanitary napkins.

Sustainability & Scalability

Integrated Model for Student Engagement: Leverages EdTech to provide adaptive learning experiences tailored to individual student's needs combined with community associates who bring empathy, encouragement and interpersonal interactions to the learning process.

Building Digital and Financial Literacy: Prioritises foundational literacy and numeracy in local languages. A coding pilot was run for girls to understand the economic benefits of digital skills and a financial literacy programme for community associates to build STEM learning in daily life.

Gender Focus

Girl-Centric Programme: Operates to improve school experience for disadvantaged girls while building confidence and agency to advocate for themselves.

Community Associates as Tutors: Female tutors selected from local communities mentor girls as well as engage with parents/community stakeholders to encourage a positive learning environment.

Impact

5,50,000+ girls supported across 8 states

6,300+ community associates

7,500+ academic support centres

₹6,000 per child cost in secondary school

Quest Alliance: Developing 21st Century Skills

Solution Offered

21st Century STEM Curriculum: Fosters 21st-century skills & promotes self-awareness, to address gender stereotypes.

Counselling and Scholarships: Provides personalised counselling and scholarship awareness assistance to students and parents.

Teacher Capacity Building: 30-hour MasterCoach programme empowers educators with 21st-century mentoring skills, laying emphasis on gender-inclusive classrooms and STEM clubs.

Sustainability & Scalability

Using Digital Platforms: Designed 10 hours of digital modules on self, gender, career, STEM careers and computational thinking and uses interactive WhatsApp based chatbot to guide students on coding challenges.

Career Quest Game: Developed web-based game facilitating career decision-making and offering insights into 24 diverse pathways.

Government Partnerships: Strategically aligned programmes with existing government policies & schemes, while forging partnerships with state education departments and civil societies.

Gender Focus

Role Model Engagement: Invites women in STEM to engage directly with students and their parents, sharing their educational and professional journeys.

Parent Engagement: Parents are invited to participate in hackathon share-out processes and orientations at school level, introducing them to various learning tools.

Impact

4,000+ schools across 9 states

28.4% increase in girls' agency

41% increase in students developing STEM mindsets

Sajhe Sapne: Building Employability Skills & Mapping Career Pathways

Solution Offered

Sapna Centers: A unique rural college model that offers a year-long career launchpad in the formal workforce followed by a lifelong network of rural women professionals. The curriculum comprises 3 key pillars: Career Games (professionalism, time management, productivity, digital literacy); Career Domains (Coding, Primary Math, Project Management & Entrepreneurship); Beyond Careers - Self & Society (SEL).

Sapnewaali Ki Seekh: Series of high quality digital content on career related information in simple Hindi that is accessible to rural youth.

Sustainability & Scalability

Rural Talent Alliance: Upcoming programme to onboard progressive employers' who see value in hiring and nurturing rural women's talent in the formal workforce.

District Partnerships: With districts' as the unit of change, they aim to kickstart Sapna Centers in collaboration with District Skills Mission, ITIs, CSOs and local businesses.

Agency Building for Sustainability: Focus on 'agency building' at the centre of its design & implementation. Outcomes measured along the lines of agency building in mobility, personal expenses, and say in family matters.

Gender Focus

Girl-Centric Approach: Sajhe Sapne exclusively works with young rural women between 18-23 years age group from marginalized groups.

Shift from Livelihoods to Growth Pathways: S.A.J.H.E framework is used as key outcome & output to define 'growth pathways'. There must be consistent growth in: Skills , Agency, Jobs Retention, Hope & Resilience, Ecosystem of Support.

Impact

Sapne Waalis from **60+** villages across 7 states

100% placement after graduation

₹15-22K starting salaries

70-80% job retention after 1 year of graduation

Annexure B

Government Initiatives for Promoting STEM Uptake among Girls

Pragati Scholarships	Awarded by the AICTE 2014, under the TechSaksham Programme (TSP) in 2014, to encourage meritorious female students to pursue higher education.
Sci-Connect	A Vigyan Prasar initiative to promote scientific temper and original thinking among school children in remote areas of Northeast India through short films, quiz competitions, and hands-on activities.
Knowledge and Awareness Mapping Platform (KAMP)	An initiative by CSIR-NISTADS (National Institute of Science, Technology and Development Studies) that aims to identify and promote gifted young learners in Science, Technology, and Humanities.
Atal Tinkering Labs	Established by the NITI Aayog under the Atal Innovation Mission in schools across India, to foster curiosity, creativity, and imagination in young minds; and inculcate skills such as design mindset, computational thinking, adaptive learning, physical computing, etc. To date, 10,000 ATLs have been set up.
Vigyan Jyoti	Introduced by the DST in 2019-20 to motivate meritorious girl students from grades 9-12 to pursue higher education and careers in STEM, particularly in areas where women are underrepresented.
OLabs (Online-Labs)	OLabs cover 170+ experiments for Science, Maths, and English. The labs designed for grades 9-12 are aligned with NCERT and SCERT.
NISHTHA 3.0	Developed on the DIKSHA portal to help teachers design experiences for children's holistic development. It has 12 modules, covering concepts such as Competency-Based Education, Play-based School Preparation Module, FLN, and Involvement of Parents and Community, among others.
Innovation in Science Pursuit for Inspired Research (INSPIRE)	Launched by the DST to attract young students, particularly in the 10-15 years age group, to pursue a career in science.
National Children's Science Congress (NCSC)	Organised annually by NCERT since 1971, for children from all over India to showcase their talents in science and mathematics and their application in everyday life.
The Initiative for Research and Innovation in Science (IRIS)	Started in 2006 to popularise STEM education and foster a spirit of innovation among students from Year 5 to Year 12 through a public-private partnership between Intel Technology India Private Ltd., DST, and the Indo-US Science and Technology Forum.
Science Express	A train-mounted mobile science exhibition, launched by the DST in 2007, which travels across India, primarily targeting students and teachers
Science Exhibition	Organised by NCERT, as a platform for Indian children to showcase their talents in science and mathematics and their practical applications.
Supernumerary Seats in IITs	To improve female enrolment in Undergraduate Programmes at IITs, supernumerary seats were created to increase female enrolment from 8% in 2018-19 to 20% in 2020-21.

Annexure C

Research Methodology

This study, conducted in collaboration with AISECT, delves deeper into the factors that prevent young girls from engaging in STEM education and pursuing STEM careers. While examining school-level interventions in detail, the report also explores the influence of diverse ecosystem enablers, including the government, funders, and industry recruiters, on nurturing STEM mindsets and aspirations among young girls. It then suggests solutions for these stakeholders to overcome the root and proximal causes influencing gender parity in STEM education.

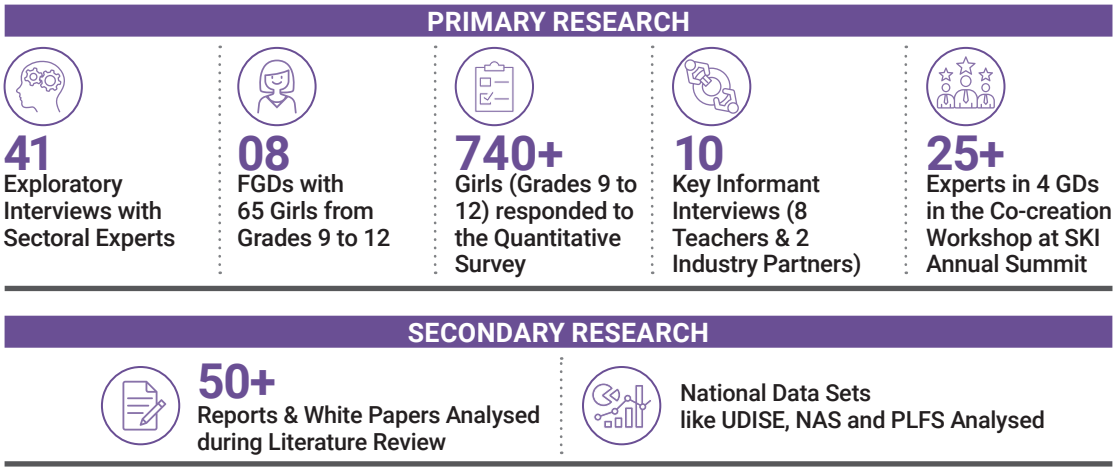
The study aims to achieve the following objectives:

- Identifying impediments to girls' aspirations and demand for STEM education, and eventually, their career decisions.
- Capturing existing solutions in the nascent STEM ecosystem which have the potential to scale.
- Articulating solution blueprints that can be scaled up, and need more investments for ensuring greater inclusion of girls in STEM education and careers.
- Recommending a scalable ecosystem.

Research Framework

The study employed a mixed-methods approach with quantitative and qualitative research methods for data collection. Both forms of data collection have been built upon extensive secondary research.

The experiences of a diverse group of stakeholders involved in the STEM education space in India have been critical in building the narrative. The study took a 360-degree view by incorporating the voices of over 800 individuals – including teachers, academicians, government policy-makers, funders, practitioners, industry recruiters and most importantly, girls from secondary and higher secondary grades. The methods used to gather data from each of these stakeholders include:



The mixed sources of data collection with girls provided a view of the problems at scale and also helped uncover the nuances of each challenge. Additionally, the analysis of the secondary data and the interviews with the government, industry, civil society and the education ecosystem helped fathom the existing solutions and identify pathways for the future.

Scope of the Study

This report is directed toward educators, policymakers, NGOs, social entrepreneurs, and education sector stakeholders who aim to strengthen STEM education for girls. It offers practical insights for shaping equitable learning environments, designing gender-inclusive programmes, and creating content that addresses the specific needs of young female students in STEM fields.

While the report offers a nuanced understanding of local challenges and interventions in the Indian context, the insights discussed are relevant to the following geographic canvas:

- Developing nations in regions such as South and Southeast Asia, and Sub-Saharan Africa.
- Countries striving to build equitable STEM education systems for a skilled, future-ready workforce.

Annexure D

SKI Annual Summit 2024 Education Workshop Attendees

Name of the Expert	Name of the Organisation
Group 1: Building an Open Network Ecosystem for Scholarships and Financial Support	
Anand Gautam	EkStep Foundation
Ashutosh Burnwal	Buddy4Study
Dr Vikas Yadvendu	ArcelorMittal Nippon Steel (AMNS)
Rimmy Taneja	Capgemini
Saurabh Johri	Piramal Foundation
Vijay Roy	Scholarlify
Group 2: Building a Digital Public Infrastructure for Career Guidance and Mentorship	
Ayush Bansal	iDreamCareer
Mahima Singh	Centum Foundation
Manish Kumar	Tata Strive
Manish Singh	BK Jindal House
Neha Agarwal	Buddy4Study
Tarun Nehra	Tata Consultancy Services
Vandana Goyal	Avanti Fellows
Group 3: Constructive Action with Community on Shifting Gender Norms on STEM	
Aakash Bhakuni	Navgurukul
Alok Dwivedi	Agastya Foundation
Arjav Parikh	Jayso foundation
Dr Pallavi Rao Chaturvedi	AISECT
Javed Abbas	Milaan Foundation
Sapna Bhavnani	Alstom
Shiv Dewan	Aflatoun International
Group 4: Leverage Assessments to Enable State Action in STEM Skills for Girls	
Ankita Kulshreshtha	Tata Consultancy Services
Aparna Singh	AISECT
Kritika Ram	Medha
Lav Bharadwaj	UNDP
Neha Parti	Quest Alliance
Radhika Yelkur	Naandi Foundation

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