



General Education Department
Kerala Government



TINKERING LAB



TINKERING LAB-Centre for Early Innovation



समग्र शिक्षा
Samagra Shiksha



Strengthening
Teaching-Learning
and Results for States



CENTRE FOR
EARLY
INNOVATION



TINKERING LAB

V. Sivankutty
Minister for General
Education and Labour
Government of Kerala
Thiruvananthapuram



THIRUVANANTHAPURAM
17/07/2025

Message

Kerala has always been a role model among all states in the field of education. Performance excellence and quality are the hallmarks of General education in Kerala.

The Kerala society's emphasis on education has contributed greatly to this achievement. The General Education Department and Samagra Shiksha Kerala, hand in hand, are implementing numerous quality interventions, paving the way for the empowerment of public education and thereby creating a new Kerala.

Kerala is among the states that have shown the best performance in the National Quality Index. This achievement has earned Kerala a place in the 'STARS' project. The goal of the 'STARS' project is to implement necessary reforms to enhance the quality and credibility of public education, design and implement innovative and flexible activities to improve educational quality, and ensure better outcomes.

This is a brief document about the major activities implemented by Samagra Shiksha Kerala under the STARS project in Kerala. I extend all my best wishes for the continuation and quality implementation of excellent activities.

With affection,

V. Sivankutty

Dr. K. VASUKI IAS
SECRETARY



General Education Department
Government Secretariat
Thiruvananthapuram-695 001

Phone-Office : 0471-2517395

Date



Message from Secretary, General Education

Samagra Shiksha represents an integrated and inclusive approach to school education, and this document reflects the innovative practices, collaborative initiatives, and community engagement that have enriched our educational landscape. I am delighted to note the commendable effort taken to present a document showcasing the academic activities carried out under Samagra Shiksha in Kerala under the STARS Project. This initiative is a significant step forward. Creating a comprehensive record of our academic endeavours is crucial for several reasons: it allows us to effectively showcase the depth and breadth of the programme, serves as an invaluable resource for future planning and implementation, and enables us to identify best practices and areas for further improvement. This document not only reflects the dedication and hard work of our educators, administrators, and stakeholders but also serves as a valuable record of the innovative and inclusive practices being implemented across the state.

The holistic development of learners is always the focus of the Samagra Shiksha, Kerala. This documentation highlights our collective strides towards that goal. From strengthening foundational learning to fostering equity and excellence in education, the initiatives captured in this document reflect the spirit of collaboration and commitment that defines Kerala's education system.

The hard work demonstrated in creating this document is truly appreciated. Such thorough documentation will undoubtedly contribute to the continued success and evolution of educational initiatives across the State, ultimately benefiting our students and the entire academic community.

I congratulate the entire team behind this initiative for their dedication and vision. May this report serve not only as a record of achievements but also as a source of inspiration for future educational endeavours.

Dr. K Vasuki IAS
Secretary
Department of General Education
Government of Kerala



Dr. Supriya A.R.
State Project Director
Samagra Shiksha Kerala

Introduction

STARS (Strengthening Teaching-learning and Results for States) is a sponsored project of the Central government implemented in Kerala through Samagra Shiksha since 2020. Numerous commendable activities have been implemented through the STARS project to improve the educational quality of Kerala. Early childhood education, foundational literacy, evaluation, improving classroom learning, streamlining educational service activities, interventions in vocational education, and physical infrastructure development are among the various programs implemented as part of the project. This booklet introduces some of the most commendable programs among them. We hope that the information in this book will be beneficial for future educational planning and implementation.

Department of General Education
Samagra Shiksha Kerala

STARS Project Document 2025

TINKERING LAB

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CENTRE FOR EARLY INNOVATIONS CEI



Vision

Kerala envisions an education system that fosters creativity, innovation, and problem-solving, enabling learners to adapt to and shape a rapidly evolving technological landscape. The State recognises that future-ready education must extend beyond textbook learning to include hands-on, experiential, and inquiry-based approaches that nurture curiosity and independent thinking.

In this context, Tinkering Labs are conceived as vibrant and creative learning spaces that promote the principle of “learning by doing.” These labs provide students with opportunities to experiment, explore ideas, and learn through trial and error, thereby strengthening their analytical abilities, resilience, and confidence.



Aligned with interdisciplinary frameworks such as STEAM and STREAM, Tinkering Labs integrate Science, Technology, Engineering, Arts, and Mathematics to provide a holistic and application-oriented learning experience. Students are exposed to modern technologies including robotics, coding, 3D printing, electronics, and the Internet of Things (IoT), enabling them to acquire practical skills and technological literacy from an early stage.

By moving beyond rigid curricular boundaries, these labs offer the tools, mentorship, and supportive environment necessary for learners to transform their ideas into real-world projects. This approach not only enhances creativity and innovation but also cultivates a spirit of inquiry and an entrepreneurial mindset.

Through the establishment of Tinkering Labs, Kerala reaffirms its vision of building an inclusive, future-oriented education system that empowers learners to become creators, innovators, and problem-solvers in a knowledge-driven society.

Objectives

The programme aims to cultivate an innovative mindset among learners by fostering creativity, critical thinking, and a scientific temper through experiential learning. By providing a platform for hands-on experimentation and “learning by doing,” Tinkering Labs encourage students to explore ideas, test solutions, and engage in creative problem-solving processes. This approach enables learners to move beyond passive learning and actively construct knowledge through inquiry and experimentation.

The initiative also seeks to equip students with technical expertise in emerging and relevant technologies such as robotics, coding, 3D printing, and the Internet of Things (IoT). Through guided exposure and practical engagement, learners acquire essential skills that are aligned with global technological advancements, thereby enhancing their preparedness for future academic pursuits and career opportunities in a competitive and innovation-driven world.



Further, the programme emphasises the development of essential life skills, including collaboration, communication, and resilience. By working on projects in teams, students learn to share ideas, engage in constructive dialogue, and collectively solve problems. The iterative nature of experimentation within Tinkering Labs also helps learners to analyse failures, learn from mistakes, and persist through challenges, thereby building confidence and adaptability.

Through these objectives, Tinkering Labs aim to nurture well-rounded individuals who are not only technologically proficient but also capable of innovative thinking, effective teamwork, and lifelong learning.

These activities not only familiarize teachers with advanced technology and equipment but also make learning experiential, engaging, and interesting for children. Teacher training, conducted in collaboration with the Kerala Startup Mission's Fab Lab in Kochi, have been met with great success. Additionally, the state-level Tinker Fest generated considerable excitement among children, teachers, and participating schools.





CEI

CONTENT

- The Vision and Mission of the Center for Early Innovation (TinkeringLabs)
- The Methodology and Approach followed by KSUM (Kerala Startup Mission)
- Designing Various Components (including layout, infrastructure, procurement of machinery/equipment, curriculum development, etc.)
- Information on Activities and Programs carried out under the CEI Initiative



Tinkering Labs are a creative learning approach designed to develop students' creativity, innovative thinking, and practical skills. These labs provide students with the opportunity to learn and apply modern technologies such as robotics, coding, 3D printing, and electronics through experiments and projects.

The activities of Tinkering Labs are designed to prepare students to meet the challenges of the next century, driven by the realization that traditional education methods are insufficient for developing practical skills and technical knowledge. Education systems worldwide are emphasizing STEAM/STREAM learning, and Tinkering Labs have become an important tool to achieve this goal. However, in India, various issues such as the educational gap between rural and urban sections, inadequate teacher training, lack of technological facilities, poor quality equipment, learning activities unrelated to the school curriculum, and lack of time—are hindering their smooth functioning. Furthermore, access to such facilities is currently limited for girls and those from economically and socially disadvantaged backgrounds.

Tinkering labs should be the foundation of future education. They should become an educational program embedded in a competency-based curriculum that includes all children. This can be achieved with the collaboration of various science and technology institutions and individuals in the community.

CEI Rollout and Development 2024–2026



- The state performed well in the School Innovation Marathon conducted by NITI Aayog.
- The Center for Early Innovation (CEI) successfully established 28 labs and commenced operations in 70 new labs.
- Impact: This expansion has led to increased curiosity in students and a strengthening of fundamental skills in STEM



Methodology

- CEI Operation: Follows a device-centered model.
- Teacher Training: Educators are trained to set up and teach effectively using the lab.
- Structured Student Access: Students use the lab under guided classroom sessions involving circuits and puzzles.
- Equipment-Oriented Training: Provides hands-on and digital instruction on operating each machine.
- Experiential Learning: Encourages rapid, student-driven experimentation.
- Challenge-Based Approach: Promotes problem-solving through activities such as Tinkerfest.
- Curriculum-Aligned Activities: Focuses on learning tasks that highlight key processes within the curriculum.

Innovative Approach of CEI in Education

The Center for Early Innovation (CEI) is transforming how students and teachers engage with STEM learning by shifting from conventional tinkering methods to a model that is teacher-led, student-centered, and closely aligned with the curriculum.

The Kerala Startup Mission, a government agency, is responsible for establishing and maintaining these labs. With high-quality equipment supplied at reduced costs, all labs can facilitate standardized and well-supported learning experiences.

The program includes a wide range of activities such as challenge-based tasks, creative and technology-integrated activities, the development of tinkering tools, project-based STEM learning, and innovation fests.



Simulated laboratory model

- Standardized technology kits
- Modular, flexible infrastructure design
- Centralized equipment storage system
- Continuous expert support and guidance throughout the implementation



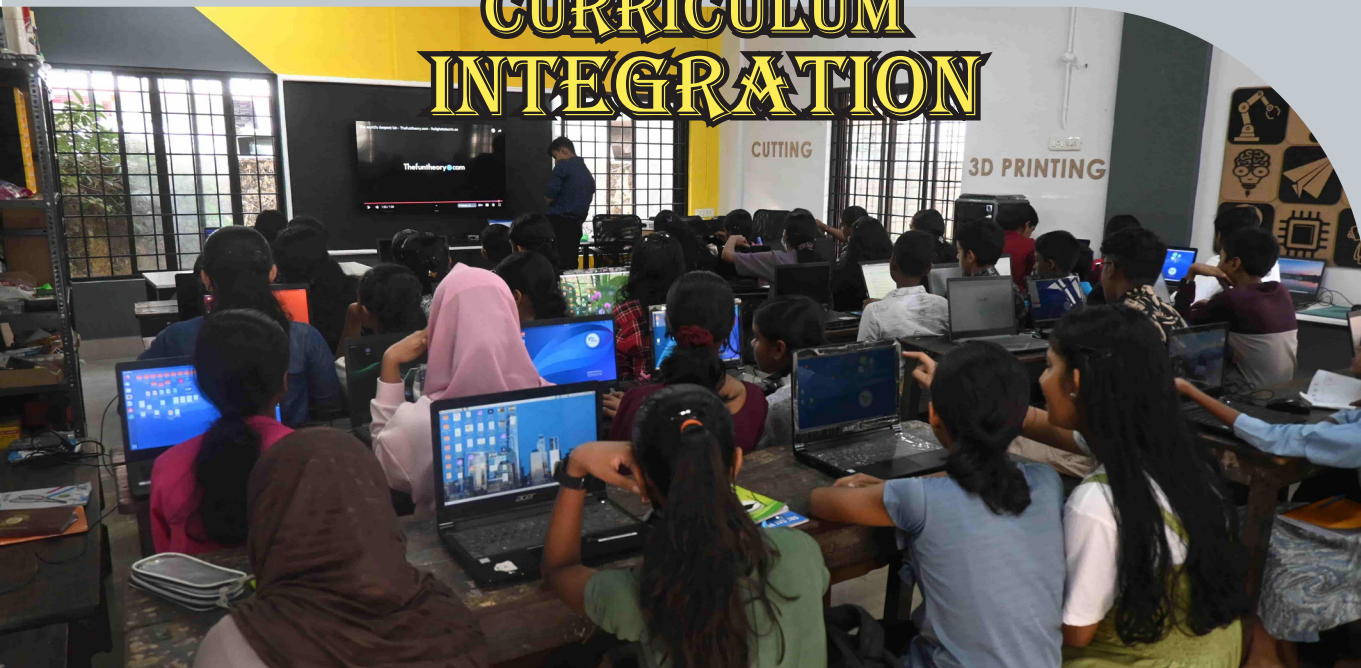
Teacher Capacity Development

CEI strengthens teacher capabilities through the following initiatives:

- Hands-on training at the Super Fab Lab in Kerala
- Ongoing mentorship provided by Field Fellows and support from the Kerala Startup Mission
- Professional learning through online sessions and peer-based forums



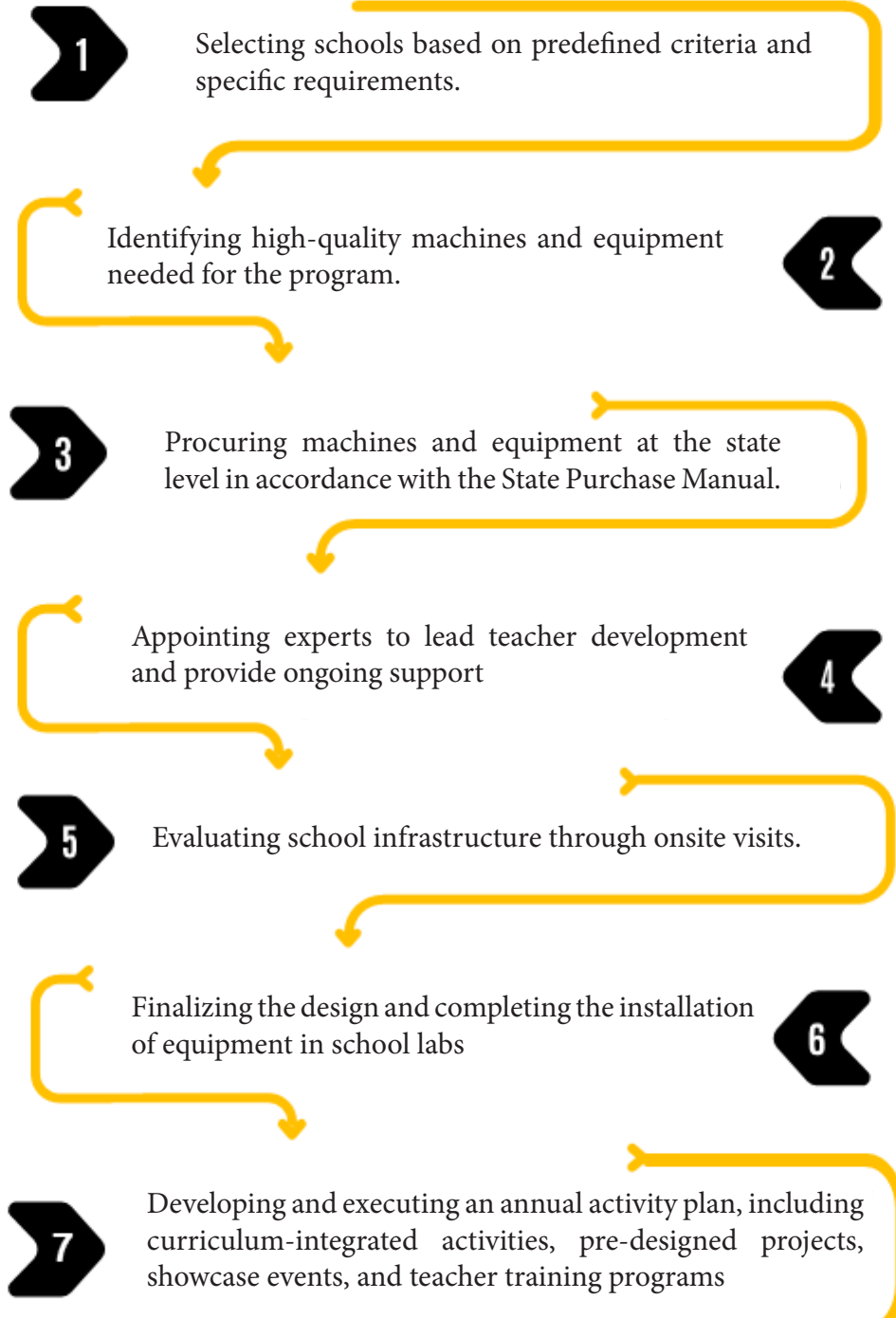
CURRICULUM INTEGRATION



- A four-stage learning cycle: Curiosity → Exploration → Prototyping → Innovation
- Curriculum-aligned projects, initially designed for Grades 6 and 9
- Classroom learning enhanced through tools and materials created using lab equipment



CEI Operational Steps



STUDENT'S PROJECT

EXPO





Students' Project Expo at the Kerala Literature Festival



As part of the Kerala Literature Festival (KLF) 2024, the Kerala Startup Mission (KSUM), Samagra Shiksha Kerala (SSK), and the Kozhikode District Administration jointly organized the Students' Project Expo. The expo aimed to inspire innovation among school students and offer them a platform to present their creative projects and problem-solving ideas. The event enabled young learners to engage with literature, technology, and society, fostering innovation and experiential learning.

Teacher Empowerment

The Kerala Startup Mission (KSUM) organized a teacher empowerment program for government school teachers in Kerala at the Super Fab Lab. The initiative was designed to equip teachers with the skills needed to integrate STEM education into their classrooms. Training sessions included hands-on workshops on 3D printing, digital vinyl cutting, and electronic sensors. The program sought to bridge the gap between emerging technologies and classroom instruction, strengthening practical STEM teaching.



State-Level Center for Early Innovation Lab Inauguration

Kerala's first CEI Lab was inaugurated by Education Minister Shri V. Sivankutty at Government Girls High School, Tripunithura. The initiative is designed to strengthen STEM learning by providing students with hands-on technical education.



Programme for Gifted Children

Kerala Startup Mission, in partnership with Samagra Shiksha Kerala, organized a 3D printing workshop at Government Girls HSS, Tripunithura. The workshop offered students practical exposure to 3D design and printing, fostering innovation and enhancing their technological skills.



TINKERFEST 2025



Tinkerfest 2025, held as part of the Kerala Innovation Festival (KIF), was jointly organized by Samagra Shiksha Kerala (SSK) and the Kerala Startup Mission (KSUM). The event also included training sessions for teachers to support students in the ideation process, further strengthening the activities of the Center for Early Innovation (CEI) labs.

Each district was represented by a team of students and teachers selected for the program. Participants had an exceptional opportunity to engage in sessions led by some of the country's leading entrepreneurs and technologists, making the event both inspiring and enriching.



Centre For Early Innovation

Is a place where you can make things. Its's a place for hands-on-learning with tools that narture creativity.



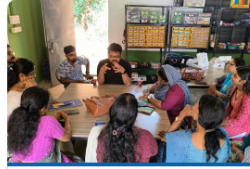
Tools & Machines

Create ways to design,experiment,build and invent as they engage in STEAM.



Tinkering Curriculum

Seamlessly integrated with the School Syllabus, ensuring that the lab activities are aligned with existing subject matter.



Workshops

Teachers will design and build teaching aids with their students, demystifying the tools in the lab



Student Projects

Project-based learning: learn by doing not just by remembering what they are told.

Conclusion

Center for Early Innovation represents a transformative shift in Kerala's education sector. Developed within the public education system with technical support from the Kerala Startup Mission, this model sets a new benchmark for tinkering labs across India. Despite its progress, further focus is required in areas such as deeper curriculum integration and enhanced teacher empowerment.

The success of CEI is driven by a strong three-way partnership between the government, startups, and the education system—an alliance that advances the state's vision of building a knowledge-based economy.

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Centre For Early Innovation (CEI)

Democratizing STEM for Kerala's future-ready talent pool
Empowering every school student with inclusive hands on learning that foster creativity and innovation.

A flagship initiative by

Samagra Siksha Kerala (SSK)

Executed by

Kerala Startup Mission (KSUM)

Under the Centrally Sponsored **STARS** Scheme funded by World bank





General Education Department
Kerala Government

About STARS

STARS (Strengthening Teaching-learning and Results for States) is an education project designed and implemented by the Central Government with World Bank assistance to improve education standards. Among the states of Himachal Pradesh, Odisha, Rajasthan, Madhya Pradesh, and Kerala implementing this project, Kerala was included considering its excellent education quality index. Kerala has been receiving the benefits of the STARS project since 2021. Numerous suitable and commendable education programmes for Kerala have been implemented as part of the STARS project.

This booklet presents one of the most important activities among them.

