Automatic Classroom Energy Saving System

A smart innovation by our Class X students — using Arduino, IR sensors, and real-time displays to eliminate unnecessary electricity wastage in classrooms.

STEM PROJECT 4

OCTOBER–NOVEMBER 2025

About the Project: STEM Project 4

Our students tackled real-world energy waste by developing an automated classroom lighting system. This initiative combines physics, electronics, and coding to promote sustainable practices within the school.

Smart Technology

Arduino, IR sensors, and TFT displays detect occupancy and manage lights.

Sustainable Impact

Eliminates unnecessary electricity usage when classrooms are empty.

Experiential Learning

Fosters interdisciplinary thinking and practical problem-solving.

Discussion in team

Why This Project Was Needed

The Problem

Lights stay ON during sports periods, assemblies, and breaks — even when classrooms are empty. Manual switching is often forgotten.

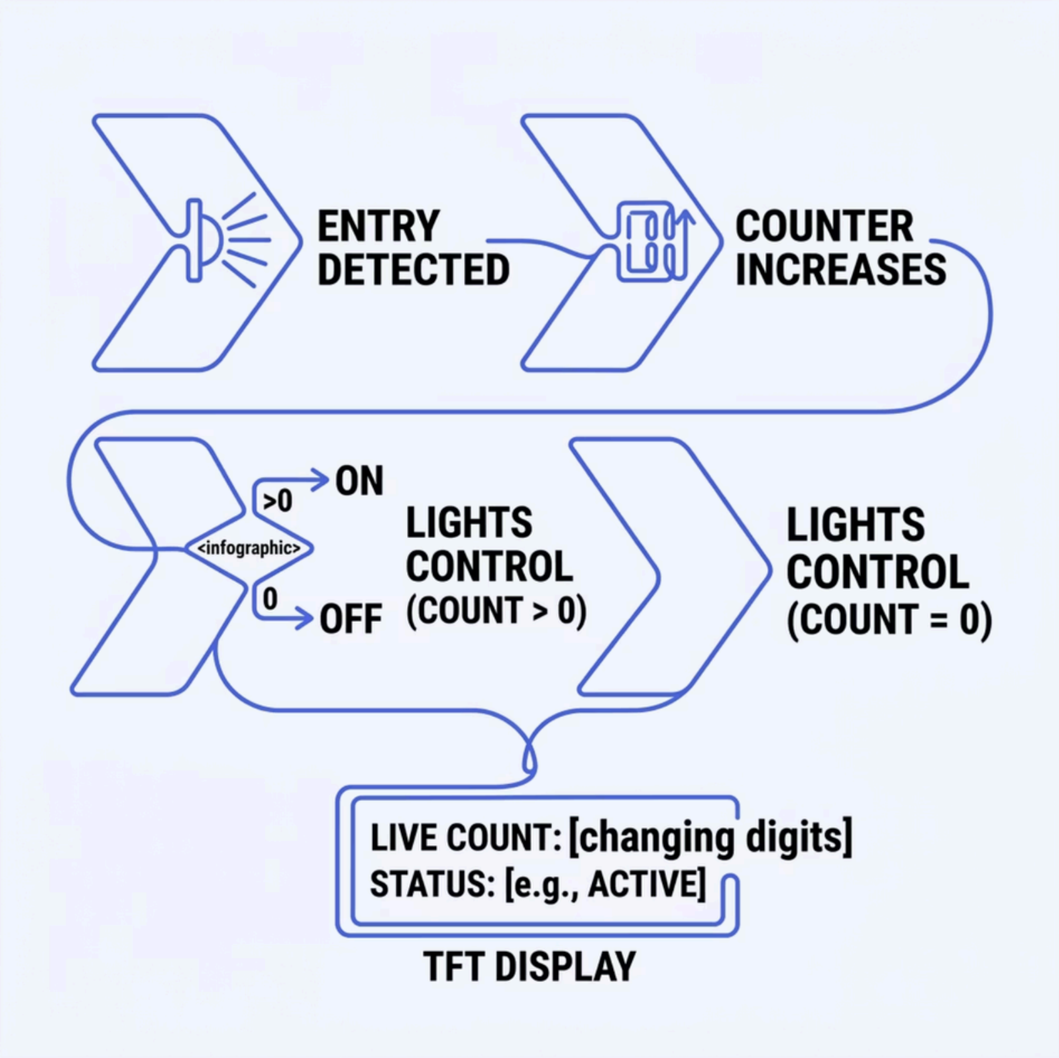
The Cost

Avoidable energy wastage leads to increased electricity bills across the school.

The Solution

Automation ensures lights operate **only when needed** and switch OFF the moment a room becomes empty.

How the System Works



Core Logic

Two IR sensors at the entrance detect directional movement. A 2.4-inch TFT display shows live data: people count, sensor status, and light condition. Count data is stored in memory — preserved even during power resets.

October – From Ideas to First Failures

The Setup

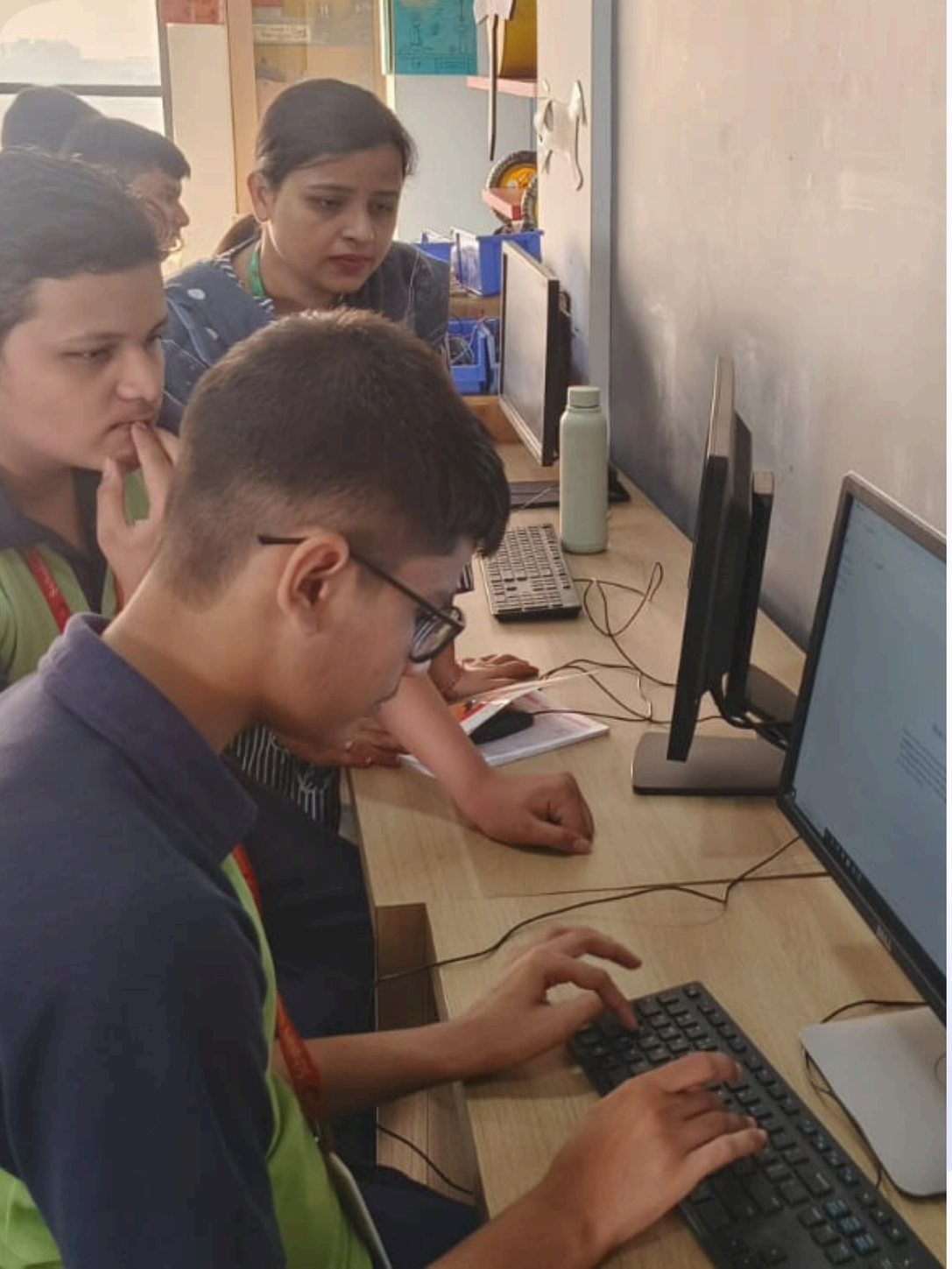
Began with brainstorming on repurposing e-waste. Collected old electronics, sorted damaged sensors, faulty displays, and loose connectors.

The Failures

IR sensors failed to detect fast movement, readings fluctuated randomly, the TFT stayed white, and Arduino reset due to power load issues.

The Lessons

Learned careful component testing, realistic expectations with e-waste, and the importance of power management and sensor calibration.



November – Rebuilding & Breakthroughs

1

Coding Issues

Undeclared variables, incorrect display drivers, EEPROM failures, and timing mismatches ruined entry–exit detection.

2

Key Fixes

Found TFT works only with HX8347D driver. Added software debouncing, external sensor power, and rebuilt counting logic.

3

Hardware Assembly

Loose wiring and sensor misalignment resolved through systematic troubleshooting.

4

System Reliable

Optimized timing, interrupts, and power flow. Complete prototype tested with accurate results and energy data recorded.

The Breakthrough

After continuous testing and refinement, the team achieved a system that works **flawlessly and automatically.**

Accurate Detection

Detects every entry and exit precisely

Live Display

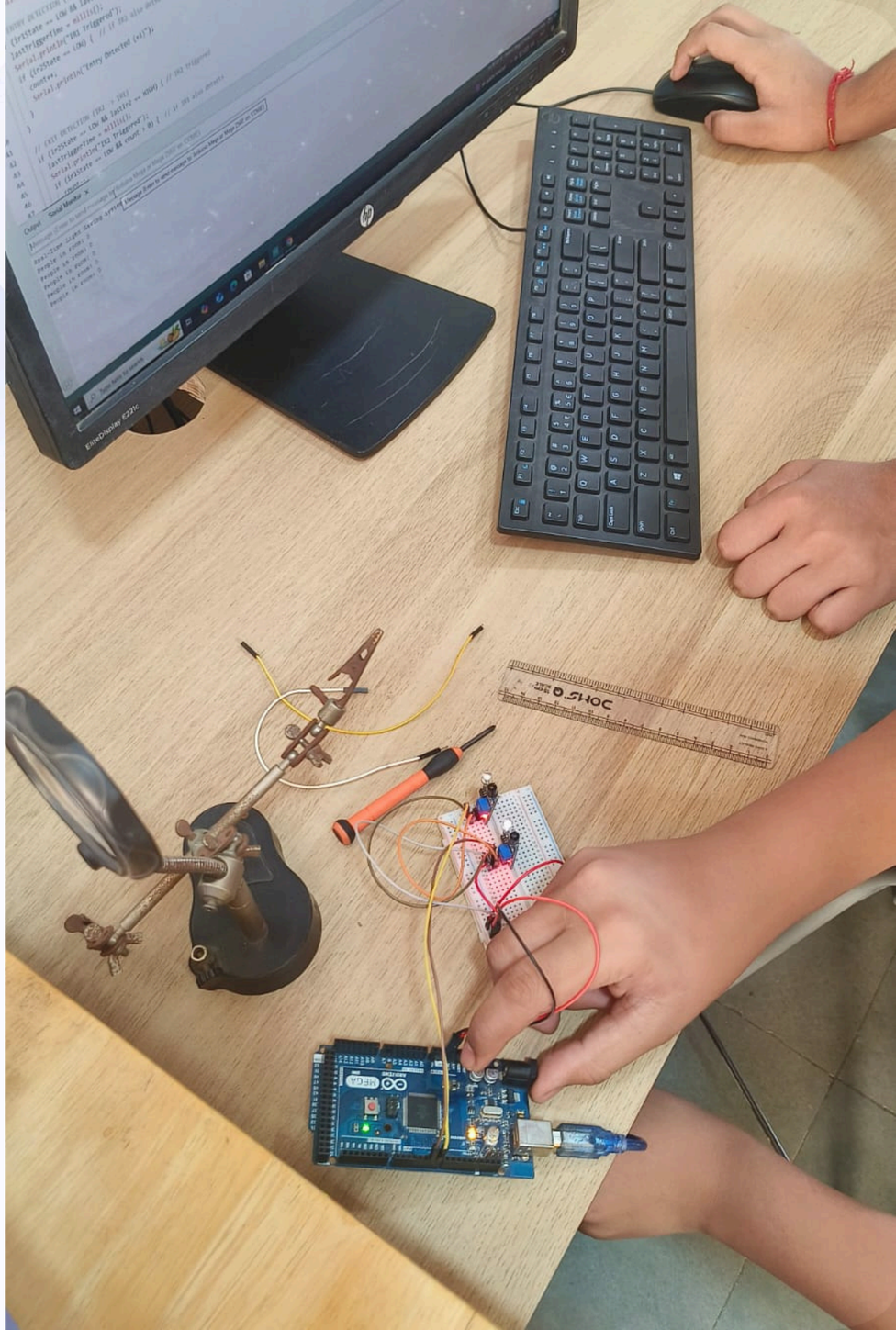
Shows real-time information smoothly

Reliable Control

Controls lights without manual intervention

Energy Saved

Saves power effortlessly and consistently



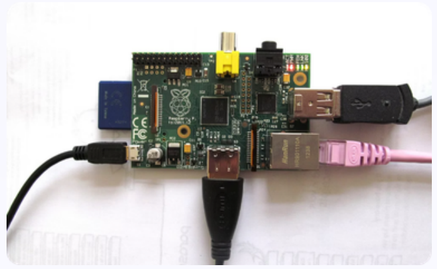
Impact on the School

If deployed across classrooms, this system can:

- Dramatically reduce electricity consumption and lower energy bills
- Promote environmental awareness among students
- Encourage hands-on engagement with automation, IoT, and embedded systems
- Become a model initiative for sustainable school infrastructure

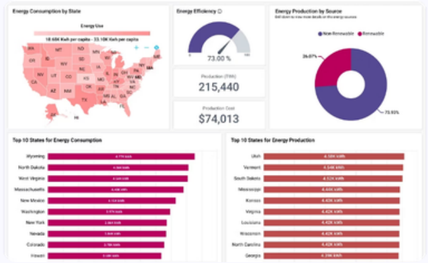
What's Next?

The team aims to transform this into a **complete smart-classroom energy management solution.**



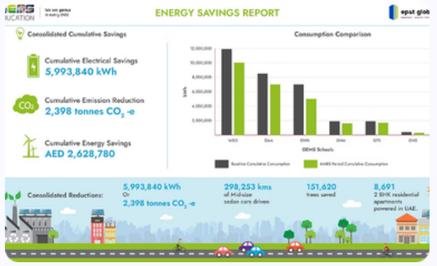
Raspberry Pi Integration

Cloud-based data logging for long-term energy tracking



Live Web Dashboard

Remote monitoring of classroom energy usage in real time



Energy Reports

Daily, weekly, and monthly energy-saving summaries

A Journey of Growth

Beyond circuits and code, this project taught our students the value of collaboration, patience, and resilience.

Technical Confidence

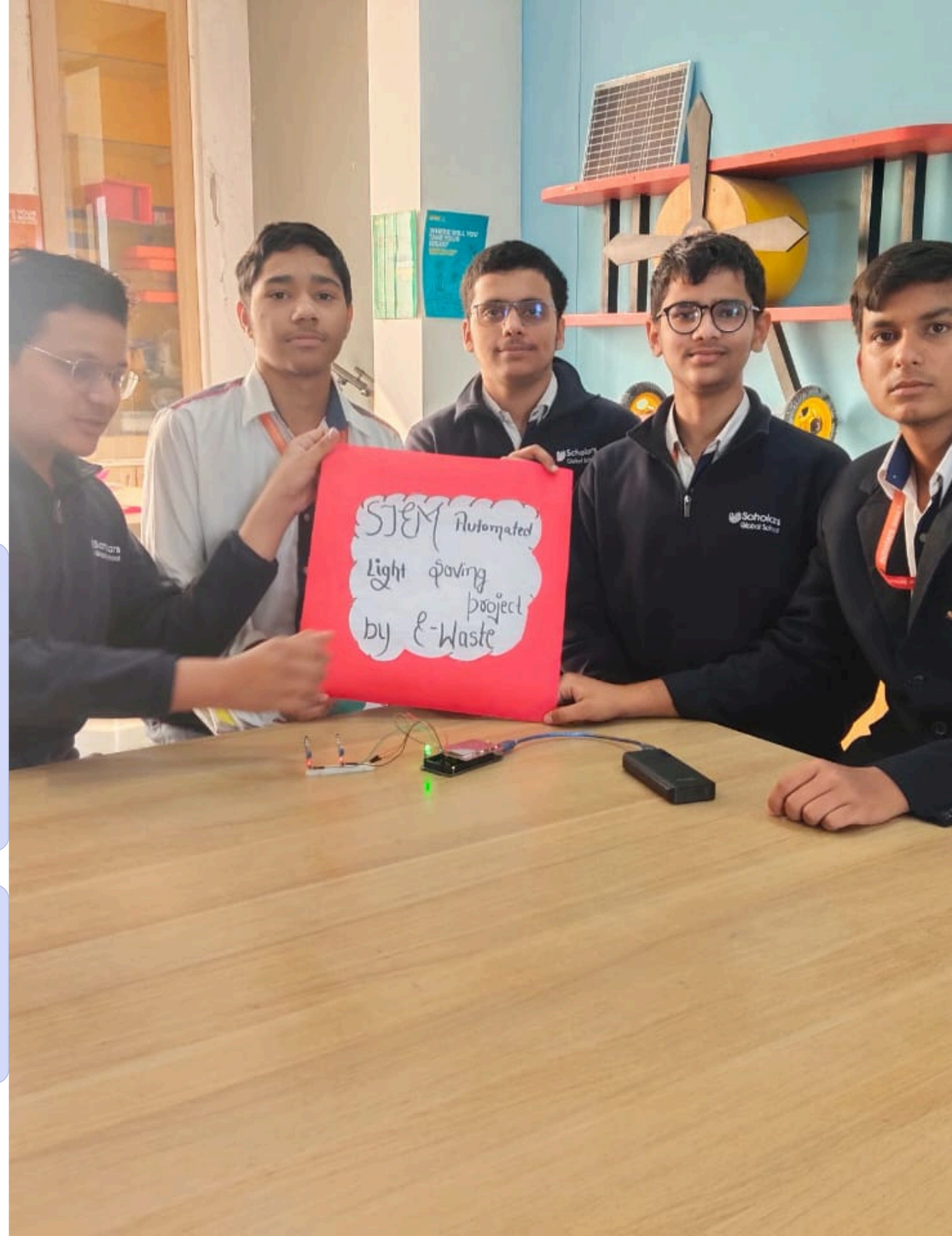
Learned to debug real hardware and think critically during failures

Teamwork

Communicated effectively and converted ideas into working solutions

Real-World Impact

Deepened belief that innovation can solve everyday problems



Proud of Our Innovators

This project reflects how young innovators can create **real-world solutions with meaningful impact** — saving energy, reducing costs, and building a greener school environment.

2

IR Sensors

Detecting every entry & exit

2.4

Inch TFT Display

Showing live real-time data

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Manual Switches

Fully automatic operation