# An IoT-Based Portable Braille Learning Device with Audio Feedback

**Subhashree Sampathkumar ***
Department of Electronics Engineering, Terna Engineering College, Mumbai, Maharashtra, India

**Vaibhav Singh**
Department of Electronics Engineering, Terna Engineering College, Mumbai, Maharashtra, India

**Siddhi Chavan**
Department of Electronics Engineering, Terna Engineering College, Mumbai, Maharashtra, India

**Deep Naik**
Department of Electronics Engineering, Terna Engineering College, Mumbai, Maharashtra, India

**Prof. Prachi Kamble**
Professor, Department of Electronics Engineering, Terna Engineering College, Mumbai, Maharashtra, India

## Abstract

Braille literacy plays a vital role in the education and independence of visually impaired individuals, yet traditional teaching methods often rely heavily on one-to-one instruction, increasing complexity in learning and limiting scalability and efficiency. This paper presents the Braille Box, an IoT-Based interactive learning device aimed to modernize Braille learning through tactile engagement, audio feedback and digital connectivity. The system employs a master–slave architecture, where the teacher's Braille Box acts as the master device transmitting data to multiple student units functioning as slaves. In classroom mode, teachers can guide and assess all students simultaneously, while in online learning mode, the same interaction occurs digitally, enabling remote education and enhancing accessibility for students in different locations. The system integrates servo motors, a microcontroller, and a voice feedback module to dynamically generate braille patterns and provide corresponding audio cues. The research methodology follows a user-centered design process, including requirement analysis, iterative prototyping, and user testing in collaboration with educators and students from schools for the blind. Experimental evaluation demonstrates improved learning speed, comprehension, and teaching efficiency compared to conventional methods. Future research aims to enhance digital connectivity, expand language support, and optimize system responsiveness to further promote inclusive education for visually impaired learners.

## Keywords

Assistive learning, audio feedback, braille, digital learning, iot, master-slave architecture.