

mBot2: Smart Home Robotics

Curriculum Overview



FOR GRADES:	3rd – 8th
AGES:	8 – 14
# OF LESSONS:	7 Units with 20+ Missions (Lessons)
CLASS TIME:	Avg of 2 hrs per Lesson
TOTAL HRS:	35+ hours (modular based on time available)
STANDARDS:	CSTA K-12 Level 2, NGSS Engineering, Math
STUDENT/DEVICE:	1:1, 2:1, or 3:1

HANDS-ON LABS FOR: STEM/STEAM, Physical Science, Engineering, Computer Science (Coding), Math courses, Makerspaces, or Camps (Virtual or Face-to-Face)

PURPOSE: Empower students to excel in 21st Century skills and empower teachers to teach Integrated STEM, NGSS engineering, and CS coding concepts in one course. This curriculum will help teachers prepare and teach an elective course or a Science or CS/STEM unit. Educators can use this guide and the lessons in this curriculum to establish a student-centered learning environment and develop 21st century skills: Critical Thinking, Creativity, Collaboration, and Communication.

LEVEL: Beginner, no prior experience in robots, engineering or coding is required of students or teachers. Teachers can use the comprehensive step-by-step lessons to learn coding and engineering just before students.

MATERIALS:

- **Robot Kit:** MakeBlock mBot2 Robot Kit (includes CyberPi and mBot2 Shield)
- **Software:** mBlock 5 App
- **Device:** PC, Chromebook, or Tablet (Android or iOS)
- **Notebook:** Engineering Notebook for each student (physical 25+ pages or digital)
- **Website:** Slide Decks, videos, worksheets, and additional digital content are available on the website for this curriculum. Teachers have the login credentials.

mBot2 STEM Challenge

mBot2: Smart Home Robotics incorporates the pillars of Computational Thinking: Pattern Recognition, Abstraction, Algorithms, and Decomposition. The curriculum provides activities, lessons, and challenges fully integrated with Science, Technology, Engineering, and Math.

Science	Physics Concepts, Data Collection, Systems Thinking, Force & Motion
Technology	Computer Science, Coding, Sensors, IoT, AI/Voice Recognition, Robotics
Engineering	Design Thinking, Prototyping, Iteration, Mechanical Systems
Math	Logic, Coordinates, Variables, Rates of Change, Measurement

Overall the activities and experiences build skills in Computational Thinking through the Engineering Design Process. The activities and challenges integrate problem solving with math, logic, sequences, and coding to complete each mission. It is engaging and exciting while exposing the value of understanding foundational concepts in STEM.

Curriculum Overview

The **mBot2: Smart Home Robotics** course is divided into two major phases, with 7 Units and over 20 missions. Each Unit uses the 5Es (Engage, Explore, Explain, Elaborate, Evaluate) model for teaching. Activities are based on "Hands-On Minds-On" and discovery-problem based learning. Inquiry, curiosity, and understanding are the guiding force behind the overall structure.

This curriculum can be used as the basis of a rigorous, entry-level elective course that introduces students to STEM, engineering, and computer science, or as supplemental materials for an inquiry science course. Students will not only operate and program mBot2 to accomplish challenges but will also learn new vocabulary, technical concepts about sensors, AI, and robotics, create algorithms and programs, solve problems, gather and communicate about data, and learn science and engineering concepts.

Because mBot2 is powered by CyberPi, a programmable microcontroller, the course begins with CyberPi fundamentals before expanding into mobile robotics:

Phase 1: CyberPi Foundations Units 1-2 ~10 hours Smart devices, IoT connectivity, voice recognition, sensors.	Phase 2: mBot2 Mobile Robotics Units 3-7 ~25 hours Assembly, movement, autonomous navigation, color sensing, Engineering Design, and the Smart Robot Showcase.
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