Matatalab

Extracurricular Curriculum

Teacher Getting Started Guide

matatalab

Matatalab Extracurricular Curriculum

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Coding Set Overview

The Matatalab Coding Set, appropriate for students ages 4 to 9, is a block-based, tangible programming tool that allows students to move a robot through an environment by way of a Bluetooth-enabled command tower and board.

Matatalab's "Coding Like ABC" tangible blocks allow students to perform and demonstrate 21st Century Skills by learning through play. With this educational tool, students learn and play in tactile ways without the need of a tablet screen or an app. Very young students may benefit from this tool since it does not require reading skills for success.

Predictive thought is important in computational thinking. Piaget's theory of constructivism includes the belief that people produce knowledge and meaning based upon their experiences. Matatalab challenges students to become critical thinkers and helps to build the students' 21st Century skills.

Parts Overview

Coding Blocks

Matatalab blocks are chunky and easy to grip. The symbols on top of each block are easy for all students to understand and grasp meaning. These symbols allow students to learn about and use representational data. There is no need for students to have reading skills, and students who speak languages other than the English should have no difficulty.

Matatalab blocks fit easily onto the raised directional nodules or pegs on the control board. The blocks are notched to fit together and enable students to easily line blocks up, orient blocks directionally, and make block connections to create effective programming.

Some blocks indicate a move forward, some a move backward, some a left turn of 90 degrees, and some a right turn of 90 degrees.

The Loop blocks allow the arrangement of movements to be repeated.

When numbered parameter blocks are attached, the robot is told to repeat a certain arrangement of movements a specific number of times.

When the Function (Fn) blocks frame the arrangement, the student has created a program or algorithm.

Basic Blocks

DIRECTIONAL	

Advanced Blocks

FUNCTION	
FUN	
NUMBER	
MUSIC	
MELODY	
ANGLE	
LOOP	

Robot

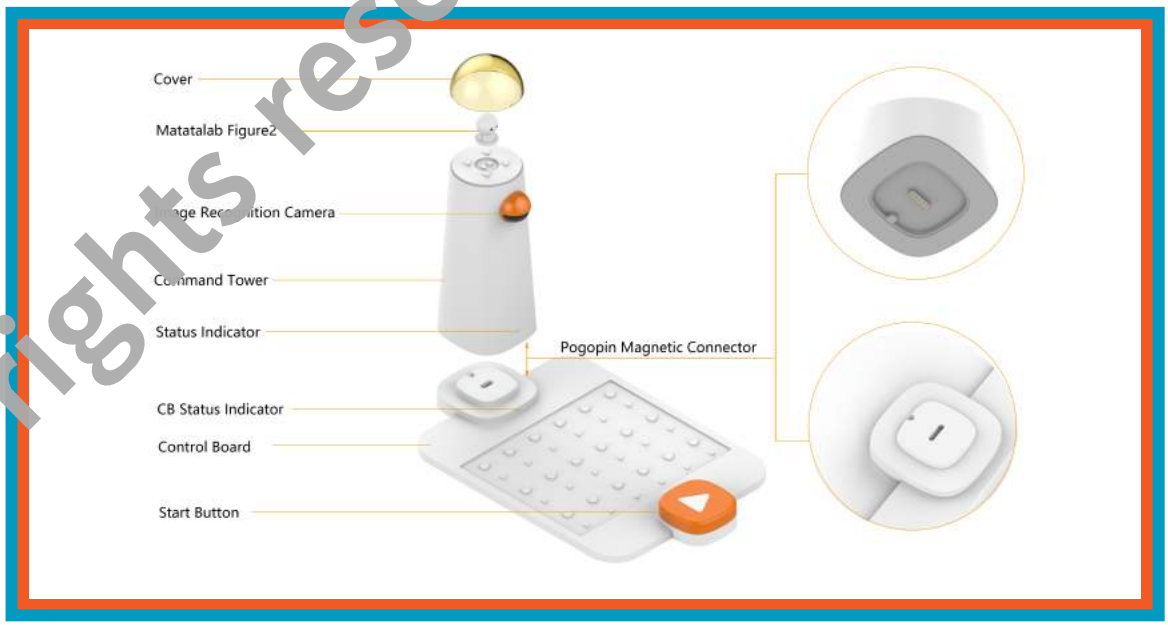
The Matatalab robot is a small, wheeled object with eye-like lights at the bottom front and a round plastic domed removable top. On the top and inside of the dome, Matatalab has placed a small action figure. Other small action figures, such as Lego® figures, may be placed inside of the dome. This allows students to personalize their experience and adds excitement and fun.

When turned on, the robot sings a tune.

It is possible to have two robots on the same mat/map, so students may collaborate in moving their robots around the board.

Command Tower and Control Board

The key to Matatalab is the command tower and control board.



When the coding blocks are placed on the control board and the orange start button is pushed, the command tower reads the code of the blocks through image recognition (taking a picture of the blocks) and through the Bluetooth connection, the code is sent to the robot.

The robot then moves through the included map according to the arrangement of the coding blocks.

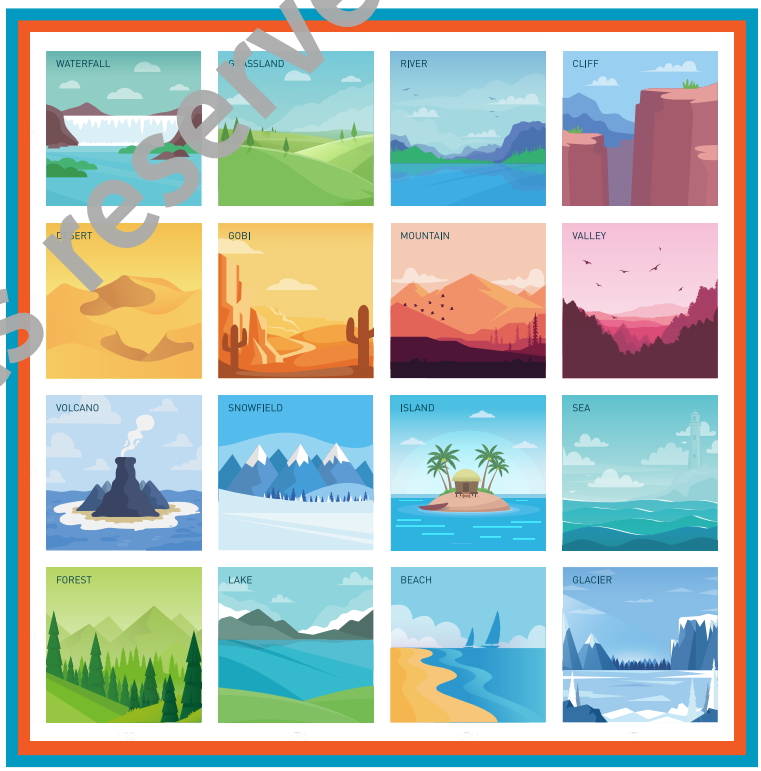
The command tower also has a plastic and removable domed top which includes a small action figure. It is possible to remove this top and replace this figure with other small action figures like Lego® figures.

The point of the tower and robot action figures is for students to understand Bluetooth functionality of sending and receiving a message.

Map Environments

Each Coding Set includes a map that incorporates 16 gridded environmental scenes. The map allows students to move their robot through each scene using the block-based coding. The lettered and numbered grid on the mat/map allows students to utilize and understand geographic skills including grid, orientation, coordinates, and directionality.

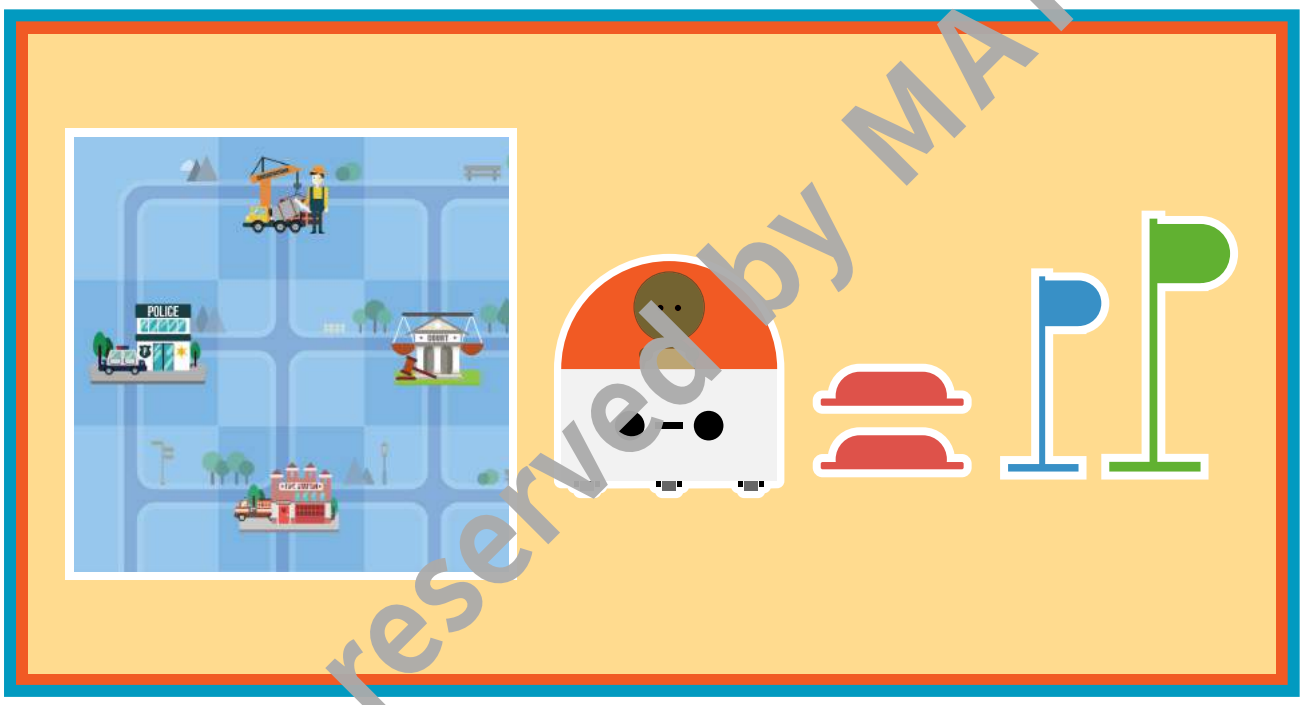
Challenge booklets arranged by levels from 1 to 3 allow students to learn through experience while coding their robot to move from one environment to another.



Obstacles and Flags

Each Coding Set also includes plastic obstacles that may be placed throughout the map environments. These obstacles help students predict movements configured through coding for their robot to move successfully through each environment.

Plastic stand-up and color-coded flags are included and allow students to see and feel a destination or end point for their robot's journey. This helps students arrange the blocks and construct their robot's program.



Challenge Booklets

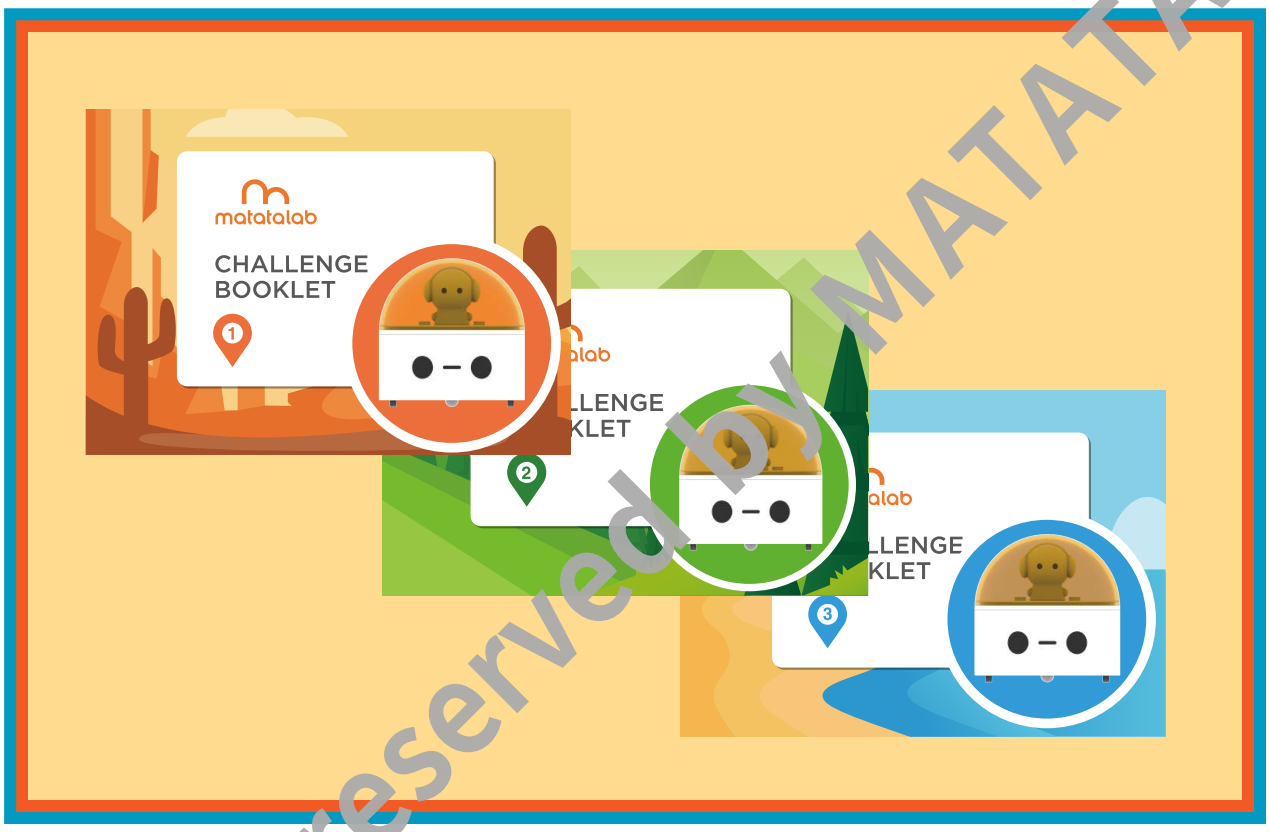
Matatalab includes student Challenge Booklets.

These booklets begin with Level 1 and progress in difficulty to Level 3.

The Level 1 booklet begins with a challenge for the student to begin at a particular location on the map and move the robot to a close location. The Level 1 booklet uses the most basic movement coding blocks with very easy steps.

When a student is ready to go to the Level 2 Challenge Booklet, obstacles and more complex coding are introduced. Numbered Parameter blocks are included, as are basic programmed Music blocks.

The Level 3 Challenge Booklet is the most complex of the coding booklets. This booklet introduces a different map, as well as loops, functions (algorithms), and numbered parameters.



Parts List

- 1 Command Tower
- 1 Control Board
- 1 Wheeled Robot
- 1 Charging Cord
- 16 Movement Blocks
- 4 Function Blocks
- 4 Loop Blocks
- 6 Numbered and Parameter Blocks
- 2 Dice Blocks
- 1 Environments Gridded Mat/Map 8 Red Plastic Stand-Up Obstacles
- 3 Plastic Color-Coded Stand-Up Flags

Powering Up & Down

Charging and Turning On/Off

In order to utilize the features of Matatalab's Coding Set, you must charge both the command tower and the robot using the included charging cord.

To turn on the command tower, push the button at the lower back of the tower. A light will turn on in the lower front. When the tower is reading the block code, a rectangular red light below the power indicator light on the front will turn on. This indicates that the code has been read and has been sent to the robot. To turn off the tower, push and hold the back button until the front lights turn off.

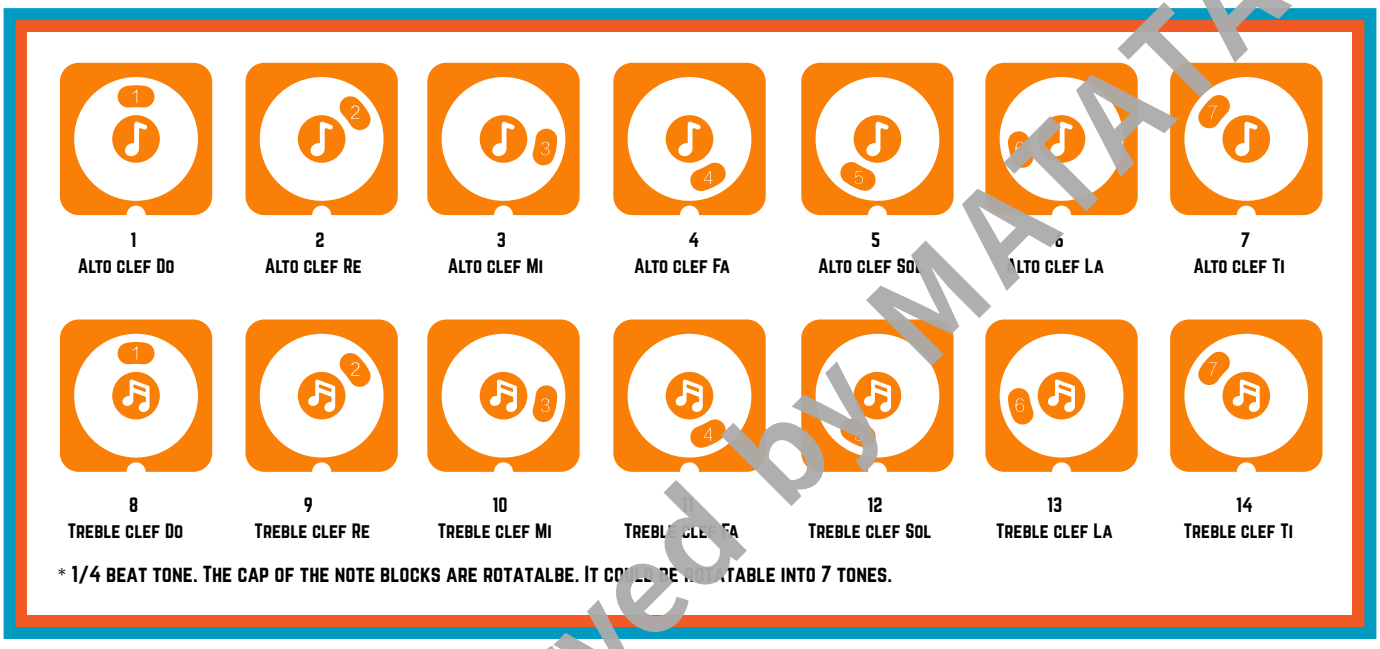
To turn on the robot, push the small rectangular button on the back. A small blue light located next to the power button will turn on. The robot will play a small tune indicating that it is ready to receive the command tower message and be programmed. To turn off the robot, push and hold the power button while the small blue light blinks, a tune plays and the robot powers down.

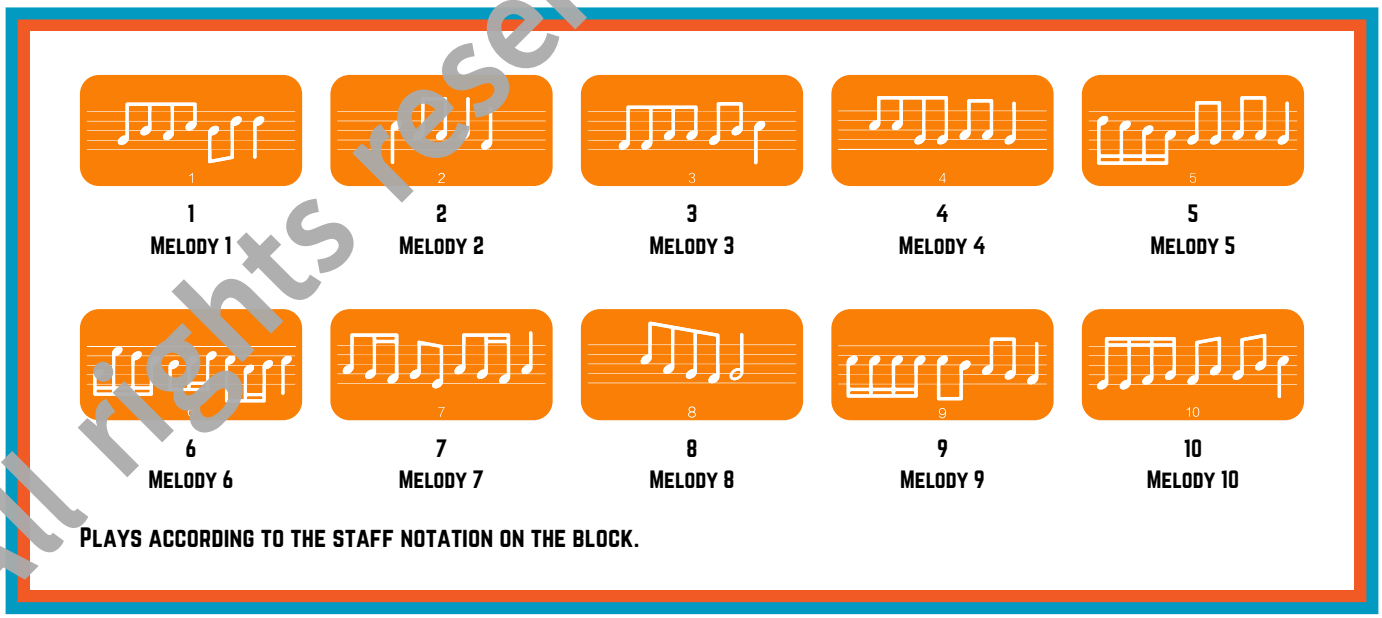
Matatalab Musician Add-on

Kids can compose their favorite music, or even create their own using music and melody blocks with the Matatalab Coding Set.

Parts List

- 32 Music blocks
- 10 Melody blocks
- 3 Music warm-up cards (6 samples)



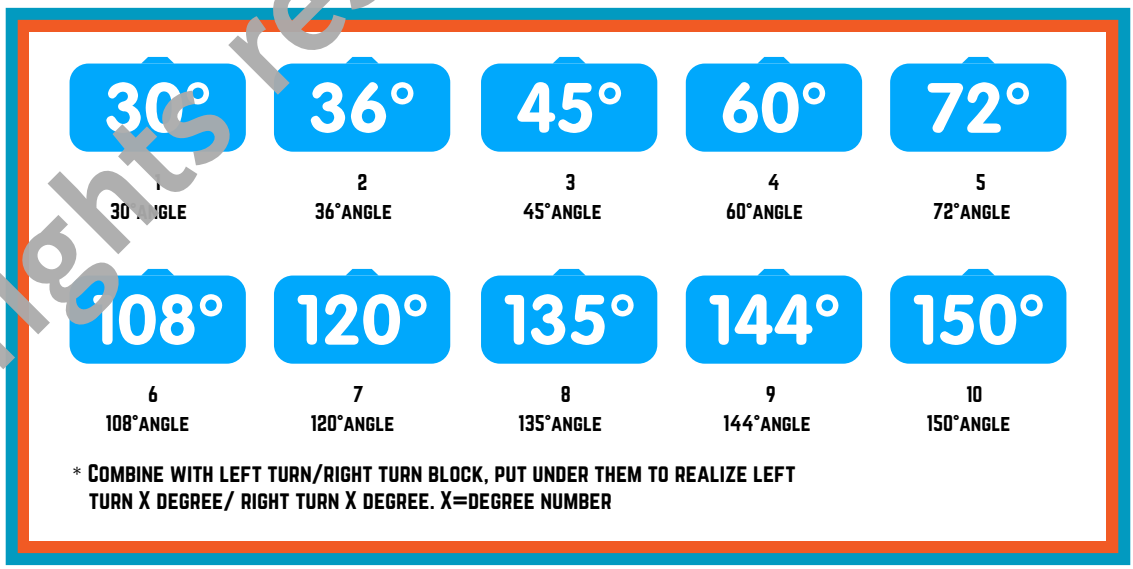


Matatalab Artist Add-on

Kids can draw graphics and pictures through programming. They will also use the more advanced stages of coding to use mathematical theories of geometry.

Parts List

- 10 Angle blocks
- 3 Washable color pens
- 3 Artist warm-up cards (6 samples)



STANDARDS

ISTE, NGSS, K12 Computer Science Network

Aligned Standards

ISTE (International Society for Technology in Education):

Empowered Learner

1c-Students use technology to seek feedback that informs and improves their practice and to demonstrate their learning in a variety of ways.
1d-Students understand the fundamental concepts of technology operations, demonstrate the ability to choose, use and troubleshoot current technologies and are able to transfer their knowledge to explore emerging technologies.

Knowledge Constructor

3d-Students build knowledge by actively exploring real-world issues and problems, developing ideas and theories and pursuing answers and solutions.

Innovative Designer

4a-Students know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts or solving authentic problems.
4c-Students develop, test and refine prototypes as part of a cyclical design process.
4d-Students exhibit a tolerance for ambiguity, perseverance and the capacity to work with open-ended problems.

Computational Thinker

5a-Students formulate problem definitions suited for technology-assisted methods such as data analysis, abstract models and algorithmic thinking in exploring and finding solutions.
5c-Students collect data or identify relevant data sets, use digital tools to analyze them, and represent data in various ways to facilitate problem-solving and decision-making.
5d-Students understand how automation works and use algorithmic thinking to develop a sequence of steps to create and test automated solutions.

Creative Communicator

6c-Students communicate complex ideas clearly and effectively by creating or using a variety of digital objects such as visualizations, models or simulations.

Global Collaborator

7a-Students use digital tools to connect with learners from a variety of backgrounds and cultures, engaging with them in ways that broaden mutual understanding and learning.
7b-Students use collaborative technologies to work with others, including peers, experts or community members, to examine issues and problems from multiple viewpoints.
7c-Students contribute constructively to project teams, assuming various roles and responsibilities to work effectively toward a common goal.

NGSS (Next Generation Science Standards):

Engineering Design

Students who demonstrate understanding can:

K-2-ETS1-1 Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

K-2-ETS1-2 Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

K-2-ETS1-3 Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

CSTA (Computer Science Teachers Association):

1A-CS-01 K-2 Select and operate appropriate software to perform a variety of tasks, and recognize that users have different needs and preferences for the technology they use.

1A-CS-03 K-2 Describe the basic hardware and software problems using accurate terminology.

1A-DA-07 K-2 Identify and describe patterns in data visualizations, such as charts and graphs to make predictions.

1A-AP-08 K-2 Model daily processes by creating and following algorithms (sets of step-by-step instructions) to complete tasks.

1A-AP-09 K-2 Model the way programs store and manipulate data by using numbers or other symbols to represent information.

1A-AP-10 K-2 Develop programs with sequences and simple loops, to express ideas or address a problem.

1A-AP-11 K-2 Decompose (break down) the steps needed to solve a problem into a precise sequence of instructions.

1A-AP-12 K-2 Develop plans that describe a program's sequence of events, goals, and expected outcomes.

1A-AP-14 K-2 Debug (identify and fix) errors in an algorithm or program that includes sequences and simple loops.

1A-AP-15 K-2 Using correct terminology, describe steps taken and choices made during the iterative process of program development.

K12 Computer Science Network:

Network Communication and Organization

Computing devices communicate with each other across networks to share information. In early grades, students learn that computers connect them to other people, places, and things around the world. As they progress, students gain a deeper understanding of how information is sent and received across different types of networks.

K-2 Computer networks can be used to connect people to other people, places, information, and ideas. The Internet enables people to connect with others worldwide through many different points of connection.

3-5 Information needs a physical or wireless path to travel to be sent and received, and some paths are better than others. Information is broken into smaller pieces, called packets, that are sent independently and reassembled at the destination. Routers and switches are used to properly send packets across paths to their destinations.

Visualization and Transformation

Data is transformed throughout the process of collection, digital representation, and analysis. In early grades, students learn how transformations can be used to simplify data. As they progress, students learn about more complex operations to discover patterns and trends and communicate them to others.

K-2 Data can be displayed for communication in many ways. People use computers to transform data into new forms, such as graphs and charts.

3-5 People select aspects and subsets of data to be transformed, organized, clustered, and categorized to provide different views and communicate insights gained from the data.

Inference and Models

Data science is one example where computer science serves many fields. Computer science and science use data to make inferences, theories, or predictions based upon the data collected from users or simulations. In early grades, students learn about the use of data to make simple predictions. As they progress, students learn how models and simulations can be used to examine theories and understand systems and how predictions and inferences are affected by more complex and larger data sets.

K-2 Data can be used to make inferences or predictions about the world. Inferences, statements about something that cannot be readily observed, are often based on observed data. Predictions, statements about future events, are based on patterns in data and can be made by looking at data visualizations, such as charts and graphs.

3-5 The accuracy of inferences and predictions is related to how realistically data is represented. Many factors influence the accuracy of inferences and predictions, such as the amount and relevance of data collected.

Algorithms

Algorithms are designed to be carried out by both humans and computers. In early grades, students learn about age-appropriate algorithms from the real world. As they progress, students learn about the development, combination, and decomposition of algorithms, as well as the evaluation of competing algorithms.

K-2 People follow and create processes as part of daily life. Many of these processes can be expressed as algorithms that computers can follow.

3-5 Different algorithms can achieve the same result. Some algorithms are more appropriate for a specific context than others.

Variables

Computer programs store and manipulate data using variables. In early grades, students learn that different types of data, such as words, numbers, or pictures, can be used in different ways. As they progress, students learn about variables and ways to organize large collections of data into data structures of increasing complexity.

K-2 Information in the real world can be represented in computer programs. Programs store and manipulate data, such as numbers, words, colors, and images. The type of data determines the actions and attributes associated with it.

3-5 Programming languages provide variables, which are used to store and modify data. The data type determines the values and operations that can be performed on that data.

Control

Control structures specify the order in which instructions are executed within an algorithm or program. In early grades, students learn about sequential execution and simple control structures. As they progress, students expand their understanding to combinations of structures that support complex execution.

K-2 Computers follow precise sequences of instructions that automate tasks. Program execution can also be non-sequential by repeating patterns of instructions and using events to initiate instructions.

3-5 Control structures, including loops, event handlers, and conditionals, are used to specify the flow of execution. Conditionals selectively execute or skip instructions under different conditions.

Program Development

Programs are developed through a design process that is often repeated until the programmer is satisfied with the solution. In early grades, students learn how and why people develop programs. As they progress, students learn about the tradeoffs in program design associated with complex decisions involving user constraints, efficiency, ethics, and testing.

K-2 People develop programs collaboratively and for a purpose, such as expressing ideas or addressing problems.

3-5 People develop programs using an iterative process involving design, implementation, and review. Design often involves reusing existing code or remixing other programs within a community. People continuously review whether programs work as expected, and they fix, or debug, parts that do not. Repeating these steps enables people to refine and improve programs.

MATATALAB
LESSON 1
INTRODUCTION

matatalab

Overview

The Matatalab Coding Set, appropriate for ages 4 to 9, is a block-based, tangible programming tool that allows students to move a robot through a nature map by way of a Bluetooth-enabled command tower and board.

The Coding Set includes a Bluetooth-enabled command tower, control board, wheeled robot, and coding blocks. The coding blocks, about the size of two Lego® bricks, allow students to place them in a coding configuration on the control board. The command tower takes a photo of the blocks configuration and at the touch of the large orange button, sends code to move the robot on the map.

Students can utilize and demonstrate their 21st Century skills through collaboration, critical thinking, communication, and creativity.

Additional resources for this lesson can be found at the end of the lesson.

Essential Objective

- Understand use of Matatalab Coding Set components in establishing directional movement.

Learning Objectives

- Describe function of the Matatalab Coding Set components.
- Explain the difference between sending and receiving messages.
- Program MatataBot using direction blocks.
- Collaborate with other students to program MatataBot.

Standards

- **ISTE:** Empowered Learner 1d; Innovative Designer 4c, 4d; Computational Thinker 5c, 5d; Global Communicator 7b, 7c
- **NGSS:** K-2-ETS1-1, K-2-ETS1-3
  3-5-ETS1-2, 3-5-ETS1-3
- **CSTA:** K-2: 1A-CS-02, 1A-CS-03, 1A-AP-10, 1A-AP-14
  3-5: 1B-CS-03, 1B-AP-08, 1B-AP-10, 1B-AP-11, 1B-AP-15, 1B-AP-16

Time

60 minutes

Materials

Per group of 4 students:
- 1 set of directional Card Symbols
- 1 Matatalab Coding Set - Parts used in this lesson will include:
  - Command Tower
  - Control Board
  - MatataBot
  - Directional Coding Blocks
  - Nature Map
  - Challenge Booklet 1
- Student journals

Teacher Set-Up and Preparation

- Charge all Matatalab Command Towers and MatataBots.

For each group of students:
- Print a set of 12 directional symbols (4-forward, 3-back, 3-right turn, 2-left turn).
- Organize 1 set of Matatalab parts used in this lesson.
- Ensure students have access to Challenge Booklet 1.

Vocabulary

- **Block-coding:** Tactile coding based upon arrangement of symbol or icon-labeled blocks.
- **Sequence:** An arrangement of instructions to be followed in a particular order.
- **Bluetooth communication:** A standard for short-wave wireless interconnection.
- **Robot:** A machine capable of carrying out a complex set of instructions as programmed by a computer.
- **Program or Code:** A specific set of instructions to be carried out by a computer.
- **Nature:** Includes land and nature located within a specific area.

LESSON 1

Introduction

"The Matatalab Coding Set is made up of a command tower, a control board, different types of coding blocks, musical coding blocks, and a wheeled robot. In this lesson, we will discuss the important parts of the Matatalab Coding Set, understand the way in which the robot moves through a nature map, and complete Matatalab Challenge Booklet 1."

- Ask students the purpose of a turning signal in an automobile. What happens when their parent uses the turning signal? (The car turns left or right.) Ask students what other directions a car can move. (Forward and reverse).
- Tell students to stand up and form a horizontal line and stand arm's length apart. Ask students to move forward one step, turn right, move backward one step, turn left. Repeat this once or twice more to gauge how well students understand directional movement. Reinforce directional movement with students as needed.
- Assign groups of 3-4 students. Define a space in the room, hallway, etc. for each group. Each group will work collaboratively to complete the following sequence. Place a forward directional card down on the floor. Place the remaining direction cards in a sequence through which students will advance. Student groups work collaboratively to complete the sequence.
- "The Matatalab Coding Set is based upon arranged coding blocks placed on the control board and read by the command tower. The command tower takes a picture of the arrangement of coding blocks and through Bluetooth communication sends a picture of instructions to the MatataBot. The command tower sends the instructions and the robot receives the instructions. This allows the robot to perform the movements that were instructed by the arrangement of blocks on the control board." "What does it mean to send? What does it mean to receive?"
- Allow students to discuss the difference between sending and receiving.
- Command Tower = Sends
- Robot = Receives

Matatalab Activity

- Distribute 1 Matatalab Coding Set and Challenge Booklet 1 to each student group.
- Point out each of the various parts: Command Tower, Control Board, MatataBot, Direction Blocks.
- Explain and demonstrate how to turn on both command tower and MatataBot.
- Explain how the tower communicates with the robot via Bluetooth communication.

- Ask students to open the Matatalab nature map. Ask students to open their Challenge Booklet 1. Name (or have students name) the various ecosystems on the nature map. Point out the start and end symbols and have students locate these symbols on the map in Challenge Booklet 1. Have students place MatataBot on the Forest square with eyes pointing towards the Volcano square.
- Ask students how many steps MatataBot needs to take to move to the Volcano. (1 step) Have students place one direction arrow block on the Control Board. Point out to students the line on the bottom of the direction blocks. Tell students that the block needs to be placed on the Control Board with the line on the bottom. Students can check coding by looking on the next page in the booklet.
- Tell students to push the large white arrow on the Control Board. There may be a pause of a few seconds, but the MatataBot eyes will turn green and the robot will move forward one block to the Volcano. (Students remove coding block from Control Board.)
- Ask students to look at the next page in their booklet. Explain that the robot will complete a turn. Ask students to find a turn block which they think will allow MatataBot to make a right turn. Students will place the block on the Control Board, press the large white arrow and observe how MatataBot turns. Did it work? Do students need to try a different block?
- At this point students should be allowed to work collaboratively in their groups and continue with activities in Challenge Booklet 1. Teacher circulates to encourage and answer student questions.

Convene the group together for closing.

Closing

Assessment

"We have investigated the use of Matatalab directional movement blocks. We have learned about the way in which Bluetooth communication allows the Matatalab command tower, in conjunction with the control board and coding blocks, to send messages to the robot in order to effect movement and direction on a map."

Have students answer the following questions:

- What role do the labels on the Matatalab coding blocks play?
- How important is bluetooth technology to the Matatalab Coding Set?
- What did you learn from your directional movement cards activity?
- How would you change the way in which you worked with the directional movement cards?
- How successful was your group in completing challenges in Challenge Booklet 1?
- What is meant by sending?
- What is meant by receiving?

Once students have been given a chance to answer these questions, students will use their journals to draw pictures of their directional activity, the arrangement of coding blocks on the Matatalab control board, and write about their experiences with their activities.

Extensions

Create a poster that lists, explains, and illustrates each of the directional coding blocks. The poster should also include a picture of the command tower and control board.

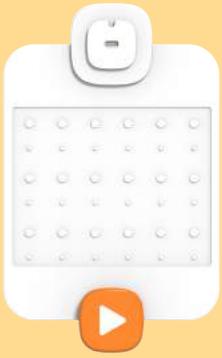
Create a game that involves sending a message and receiving a message. This could be based on a telephone game where one student makes up a message, says the message to someone next to that student, and that student sends the messages to the student next to him or her. This game could continue until the last student receives the message. Students could then discuss the way in which the message changed from the original message to the final message. Students could be challenged to create a different type of sending and receiving game. This could be based on the sending of a ball in a particular sports game and reception of the ball.

Real World Connections

Think About

Bluetooth communication technology is important and used in many different tools today. What tools can you think of that include Bluetooth technology? Why is Bluetooth technology important? What do you think would happen if we didn't have Bluetooth technology?

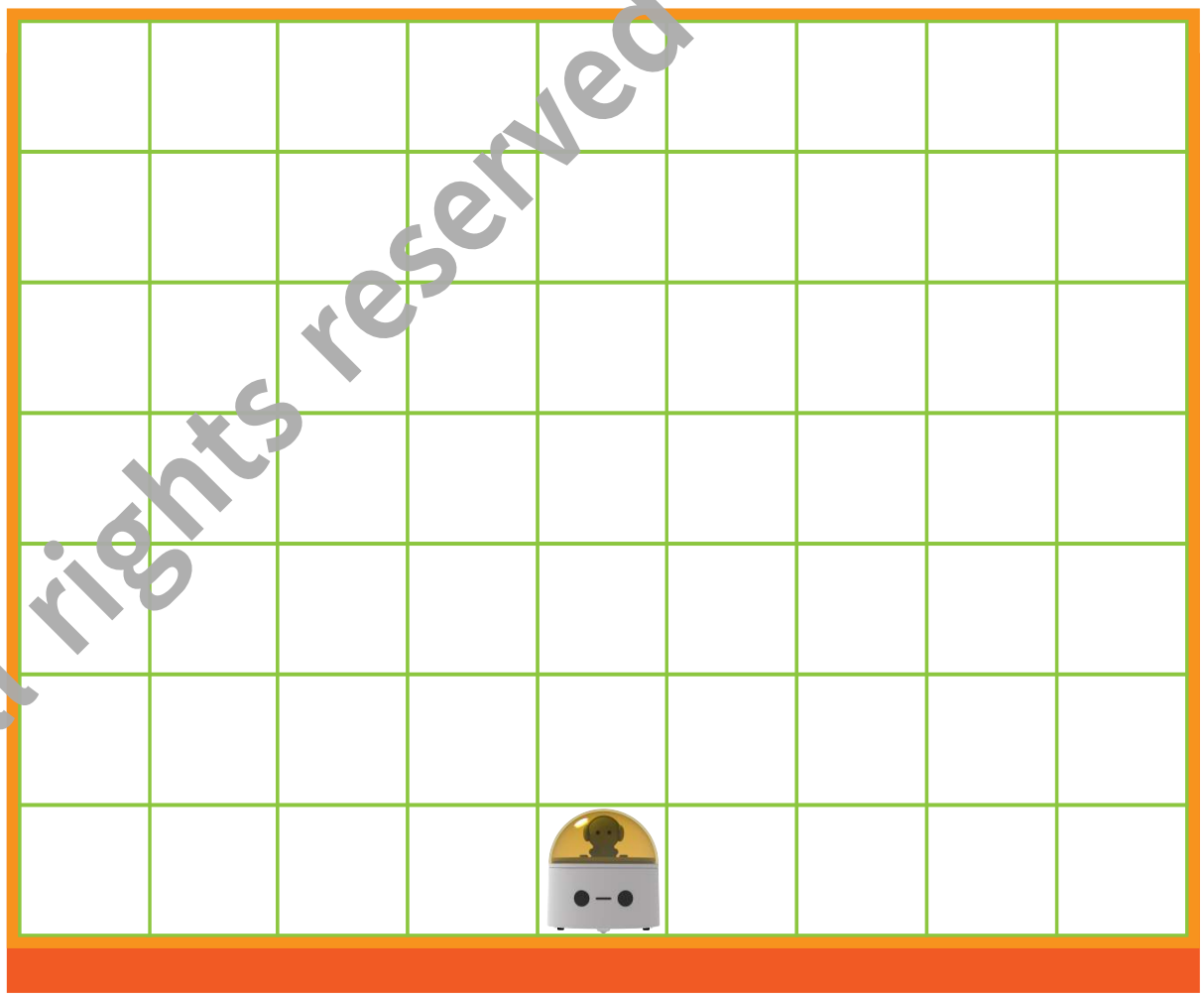
A program or code is a specific list of instructions to be used by a computer. In what other instances do we use a specific list of instructions? What would happen if one part of the list of instructions were to be taken away? How would that impact the code?

MATATALAB COMPONENT	WHAT DOES IT DO?
 Control Board	
 Command Tower	
 MatataBot	

CAN YOU DECODE THIS SEQUENCE?

- USE THE WORDS IN THE WORD BANK
- WRITE THE WORD THAT DESCRIBES THE MOVEMENT FOR EACH TILE
- DRAW THE MOVEMENT FOR THIS SEQUENCE IN THE BOX AT THE BOTTOM

- FORWARD
- LEFT TURN
- FORWARD
- RIGHT TURN
- FORWARD
- FORWARD



BLOCK MOVEMENT

- DRAW A LINE FROM THE CODING BLOCK TO THE CORRECT MOVEMENT

FORWARD

BACKWARD

RIGHT

LEFT