Matatalab

Learning Station Curriculum

Teacher Getting Started Guide

matatalab

Matatalab Coding Set

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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 table 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 by way of prongs, 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

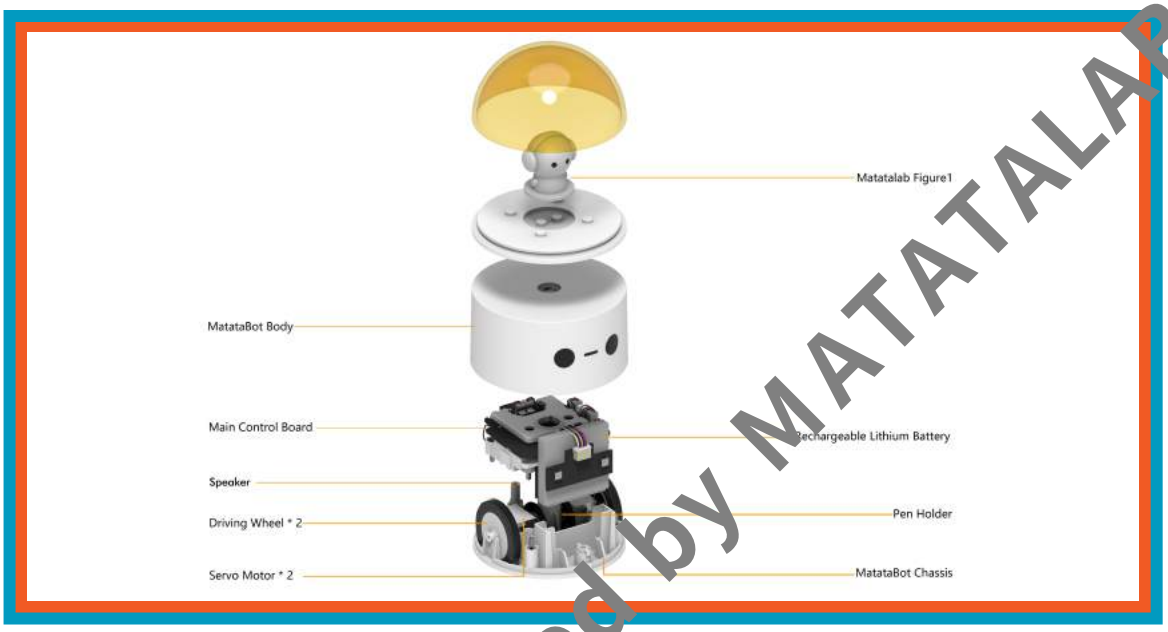
FUNCTION	
FUN	
NUMBER	
MUSIC	
MELODY	
ANGLE	
LOOP	

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 place inside of the dome. This allows students to personalize their experience and adds excitement and fun.

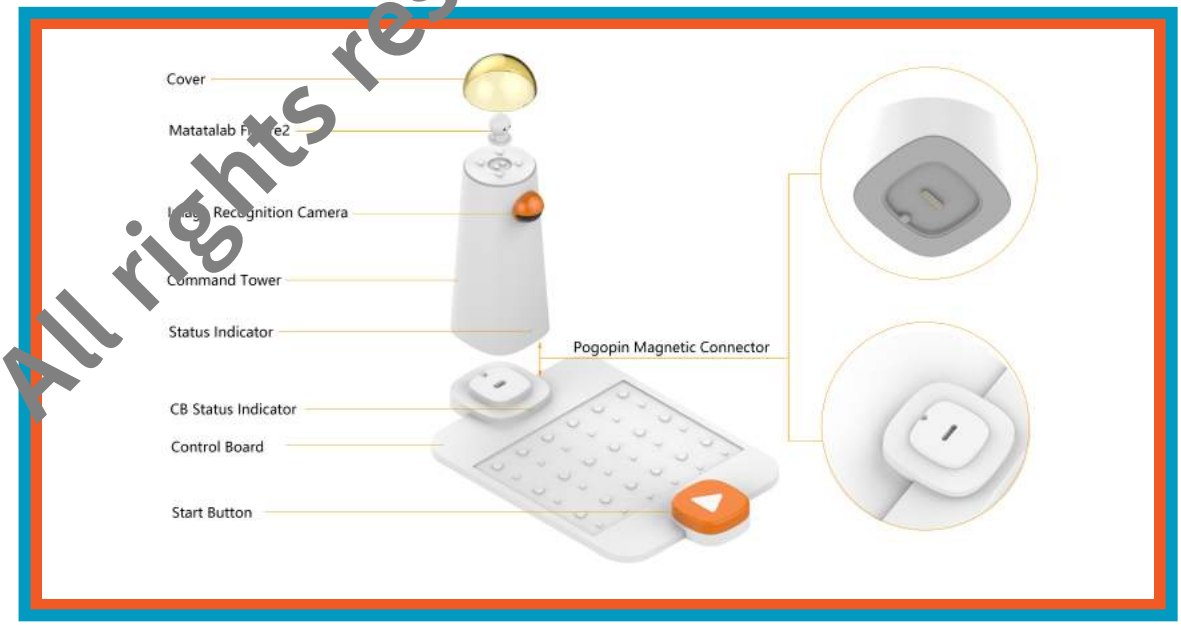
When turned on, the robot sings a tune.

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.

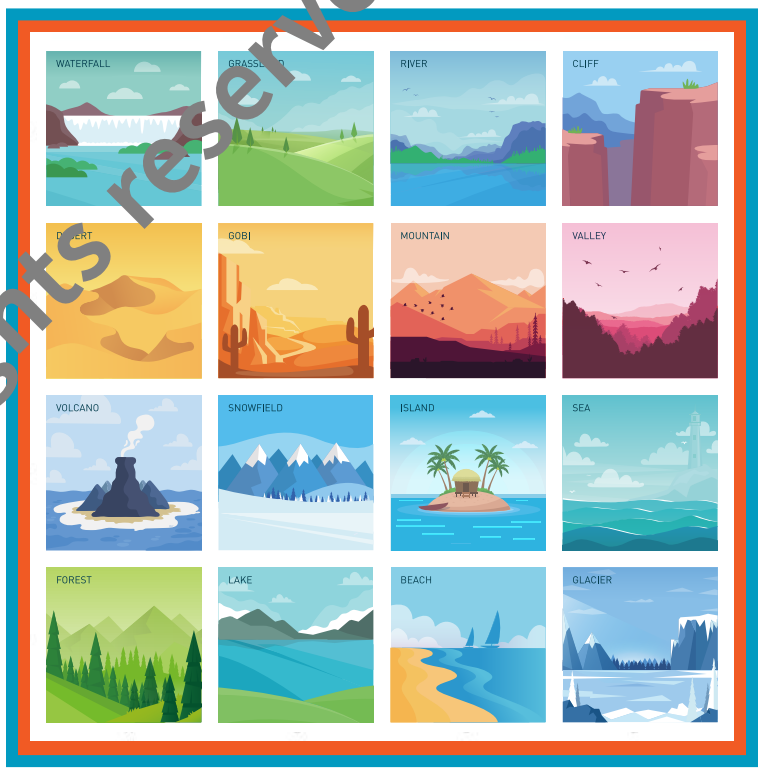
The command tower also has a plastic and removeable domed top which includes a small action figure. It is possible to remove this top and replace this figure with other small action figures like Lego® figures.

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

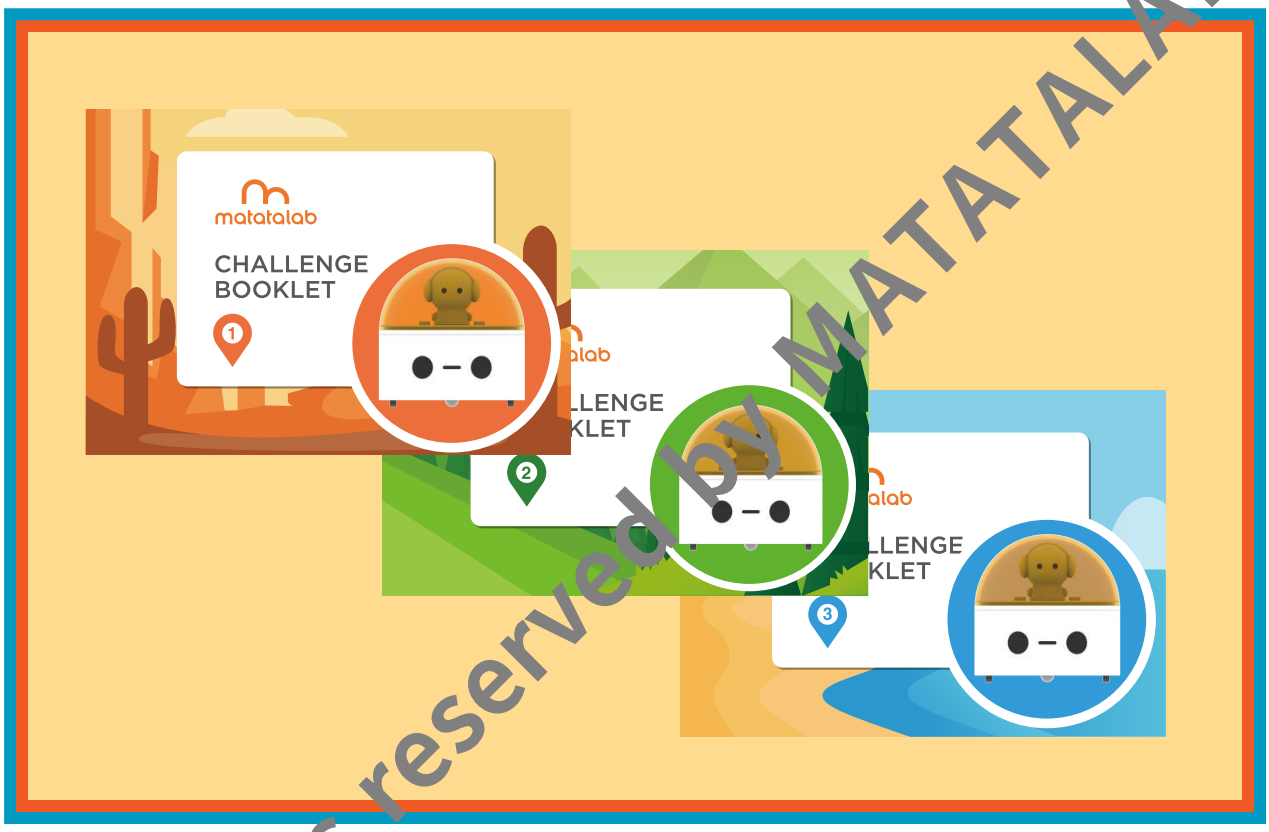
Matatalab includes student Challenge Booklets.

These booklets begin with Level 1 and progress in difficutly 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
- 8 Numbered and Parameter Blocks
- 2 Dice Blocks
- 1 Environments Gridded Mat/Map
- 8 Red Plastic Stand-Up Obstacles and 3 Plastic Color-Coded Stand-Up Flags
- Musician and Artist Add-on Sets

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.

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.
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 execu-tion.
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 - 4
GETTING STARTED

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 an environment 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 orange start 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.

- Refer to the following videos to learn more:
  - Matatalab - Coding Like ABC
    https://www.youtube.com/watch?v=FN0CYCI9NkA
  - How Does it Work? The Matatalab Hands-On Coding Robot Set
    https://www.youtube.com/watch?v=a4ElsiZOyKo

Essential Objectives

- Learn about the components of the Matatalab Logic Set.
- Learn how to utilize block coding.

Learning Objectives

- Describe the components of the Matatalab Coding Set.
- Learn about the importance of coding and programming.
- Understand the difference between sending and receiving messages.
- Collaborate with other students as they program Matatalab robot.
- Challenge each other to program the Matatalab robot in order to move through different mat/map environments

Standards

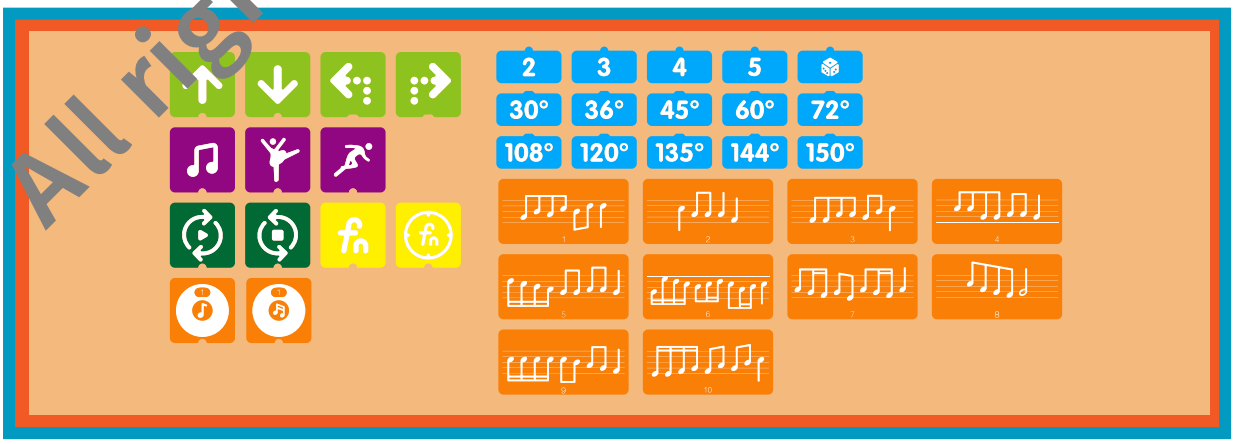
- ISTE: 1c, 3d, 4a, 4d, 5a, 5d,7b, 7c
- NGSS:K-2-ETS1-1, K-2-ETS1-2, K-2-ETS1-3
- CSTA:1A-CS-01 K-2, 1A-DA-07 K-2, 1A-AP-08 K-2, 1A-AP-09 K-2, 1A-AP-12 K-2, 1A-AP-13 K-2, 1A-AP-11 K-2, 1A-AP-14 K-2, 1A-AP-15 K-2

Time

- 20 minutes per lesson.

Materials

- Matatalab Coding sets – enough for each group of four students
  - 1 CommandTower
  - 1 Control Board
  - 1 Wheeled Robot
  - 16 Movement Blocks
  - 4 Function Blocks
  - 4 Loop Blocks
  - 8 Numbered and Parameter Blocks
  - 2 Dice Blocks
  - 1 Environments Gridded Mat
  - 8 Red Plastic Stand-Up Obstacles
  - 3 Plastic Color-Coded Stand-Up Flags
  - Level 1 Challenge Booklet
  - Student Journals



Teacher Set-Up and Preparation

- Lay out Matatalab Coding Set pieces
- Schedule access to a large open space
- Have Student Journals available

Note: Lessons 1-4 Getting Started focus on introducing Matatalab and computational thinking. The teacher may want to conduct these lessons in large group with small student cluster groupings.

Student Management

- The introduction will work best in a large group.
- Assign a Matatalab Coding Set for each collaborative student group with up to four students in a group.

Vocabulary

- **Coding:** The action or process of writing a computer program.
- **Robot:** A machine capable of carrying out a complex set of actions programmed or coded by a computer.
- **Environment:** Area in which a person, animal, or plant lives.
- **Map:** A drawing or representation usually on a flat surface of a whole or part of an area.
- **Message:** A piece of information you send to someone.

LESSON 1

Vocabulary to Get Started (20 Minutes)

Teacher-Led Introduction

"We will be learning about the Matatalab Coding Set which includes a robot that moves with coding blocks and messages sent from a command tower. The command tower reads the arrangement of blocks that you place on the control board. The tower then sends a message to the robot that allows the robot to move on the map."

- Introduce the meaning of coding, robots and robotics, and sending and receiving messages.

Students Discuss - Create - Share

- Discuss vocabulary in groups.
- Create and draw pictures representing vocabulary.
- Share pictures with the rest of the group.

LESSON 2

Sending and Receiving Messages (20 Minutes)

Activity

Place students into groups of up to 4 in each group. These groups will work together to create at least 3 short simple messages. One message might be "School is fun." Another message might be "Today's lunch is a sandwich."Schedule access to a large open space. Before taking the groups to the space, have the students plan their short simple messages.

At the space, arrange students so that half of the group of collaborative teams are on one side of the space and the other half are on the other side of the space. Allow each collaborative team to take a turn sending their messages by yelling them out and allowing the students on the other side of the playground to decide what each message is. Alternate teams by switching and allowing the senders to be the receivers.

Once the groups have had time to send and receive messages, bring students back to the classroom.

Students Discuss - Create - Share

- Discuss the messages, what is meant by sending a message and what is meant by receiving a message. Relate sending and receiving to the functions of the Matatalab command tower, which sends messages, and the functions of the Matatalab robot, which receives messages.
- Create and draw a symbol that represents sending a message and a symbol that represents receiving a message in Student Journals.
- Share drawings from Student Journals.

LESSON 3

Understanding Blocks, Obstacles and Destinations (20 Minutes)

Activity

Previous to this lesson, create enough sets of index cards for each collaborative group. Each set of cards should include one card for each of the following:

- Direction and Movement - Picture of an arrow
- Numbers - Picture of a number
- Loops or Circles - Picture of a circle with arrows
- Fn or Function blocks - Picture of "Fn"
- Music, Dancing, or Running Person blocks
- Plastic Stand-up Obstacles - Picture of an obstacle
- Stand-Up Flags - Picture of a flag

Direct students to the Matatalab Coding Set pieces previously laid out prior to this lesson. Keep students in their previously arranged collaborative groups.

The student will

- Sort the blocks and obstacles by the categories.
- Place the appropriate index card with each set.

Students Discuss - Create - Share

- Discuss the meaning and purpose of each category.
- Create and draw one picture of each category in their Student Journals.
- Share drawings from Student Journals.

LESSON 4

Getting Started with Coding (20 Minutes)

Activity

Ensure that students retain their collaborative groups of four with enough copies of Challenge Booklet Level 1 for each group and a Matatalab Coding Set for each group.

Students will begin at page one of the booklet, follow the picture and placement of each block and flag destination on the control board. Once the block has been placed, the students should push the big orange button on the control board and check the robot's location against the picture in the booklet to receive immediate feedback about their success. Students will complete Challenge Book Level 1.

Students Discuss - Create - Share

- Discuss exploring the map with blocks and flags.
- Create and draw a route from the book in their Student Journals.
- Share drawings from Student Journals.

Convene the group together for closing.

Closing

Assessment

Remind students:

We have learned new vocabulary, information about sending and receiving messages, and we have completed the Level 1 Challenge Booklet of Matatalab Coding Set.

Answer the following questions:

- What is meant by coding?
- How did the Matatalab robot react to messages sent from the command tower?
- What types of movement blocks allowed the robot to move forward?
- What types of blocks allowed the robot to turn?
- What kinds of environments or locations were on the map?
- What surprised you most about Matatalab?
- What would you change about today's lesson if you could?

Once the students have been given a chance to discuss these questions, students will be given time to draw pictures of Matatalab command tower, control board, robot, and some of the coding blocks in their Student Journals. Students could share their pictures.

Extensions

Create a book or booklet comparing and contrasting machines that send messages and machines that receive messages.

Create an environment or map to use with the Matatalab robot. The environment could be based upon a planet or it could be an imaginary country. Students should be challenged to be as creative as possible. Students then use the Coding Set to move the robot around their created environment.

Real World Connections

Think About

Today, there are many satellites that surround and orbit our planet that receive messages as well as send them back to earth like the Matatalab Command Tower. How important do you think satellites are for our system of communication today? What would happen if these satellites no longer worked? How would

messages be sent and received then? What would be the consequences of this?

Coding or programming is basically a specific list of directions that tell a machine what to do. What are some other examples of activitiess that require specific lists of instructions? One example may be a recipe that must be followed to the letter. If you leave out an ingredient, the baked good might not look right or taste very good.

Teacher Resources

Challenge Booklets

*Challenge Booklet 1 includes- Start, End, Forward, Right Turn, Left Turn, Back

CHALLENGE BOOKLET 2

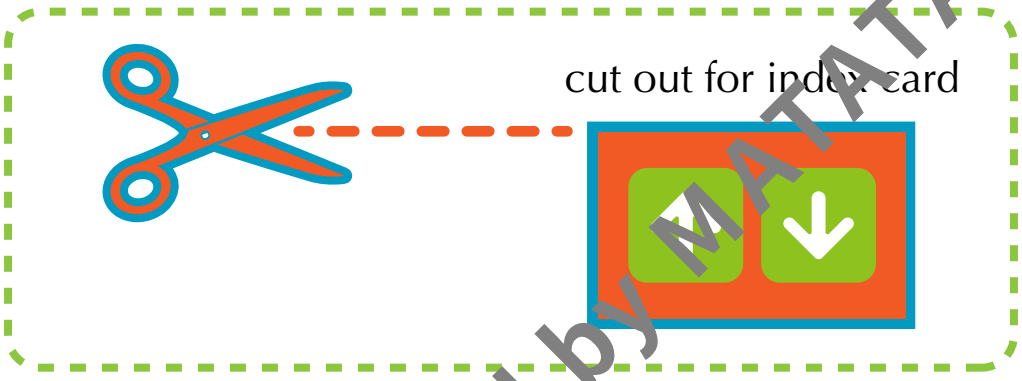
*Challenge Booklet 2 adds- Obstacles, Parameters, Music Block

CHALLENGE BOOKLET 3

*Challenge Booklet 3 adds- Loop, Function

Templates

Print out the following pictures and attach each to an index card. These will be your set of index cards for Lesson Three. Make a set of each of the cards for each collaborative student group.

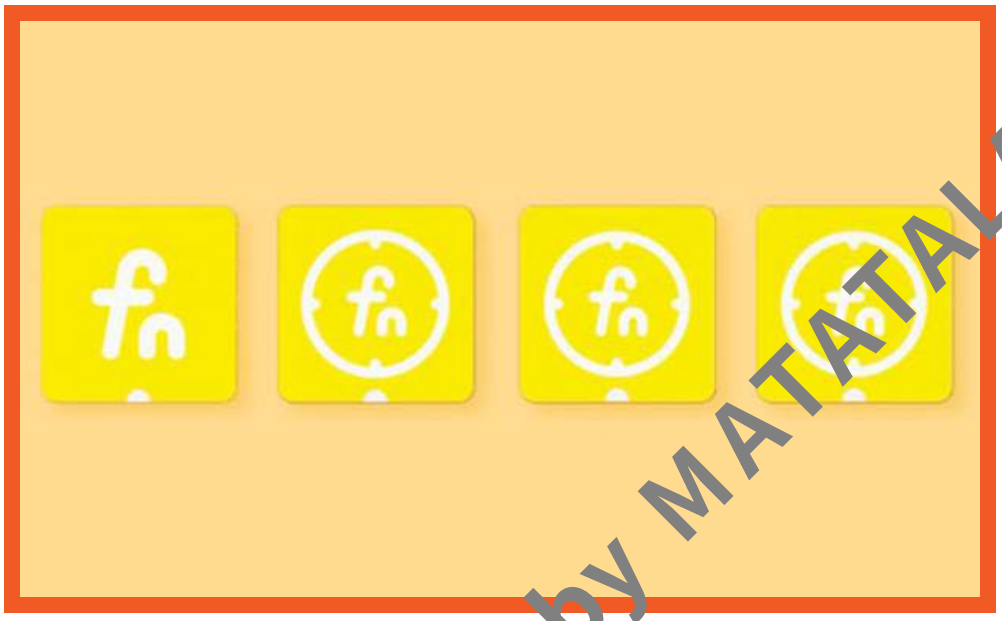


Movement Blocks

Number Blocks

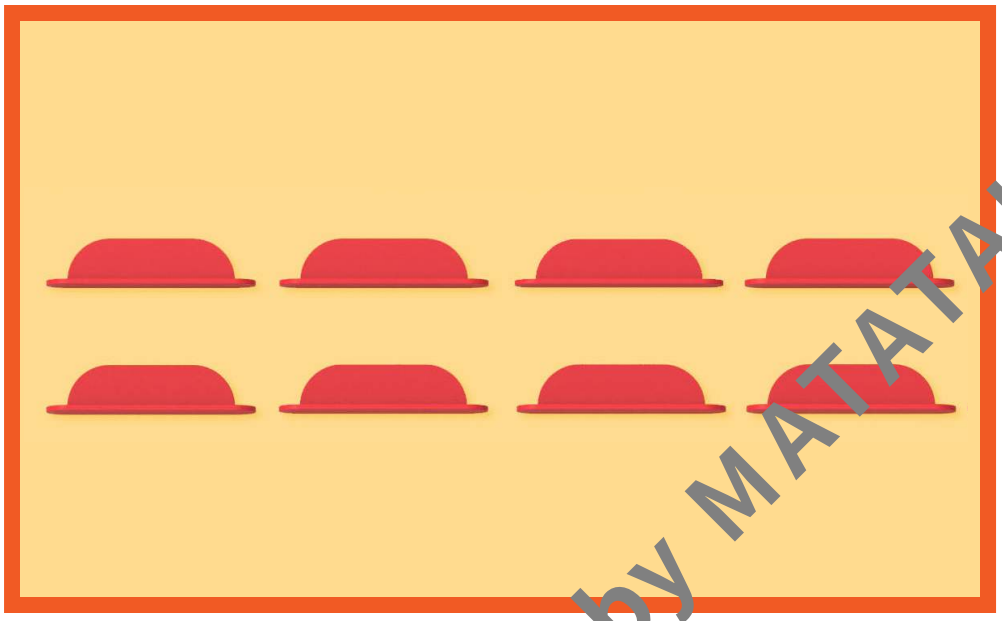
Loops Blocks

Fn or Function Blocks



Music, Dancing, Running Blocks

Stand-Up Obstacles



Stand-Up Flags