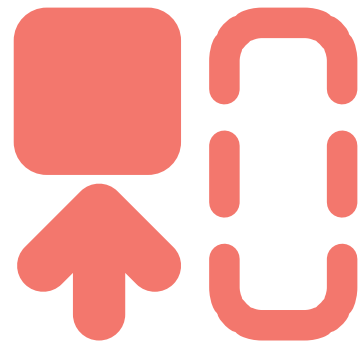


Code to animate

Don't know where to start? Start here!
The Teacher Guide for Matatalab's Animation Add-on has sixteen engaging lessons for you to do with your students. Written by expert K-8 robotics educators, these lessons are sure to engage and inspire as you Code to animate.

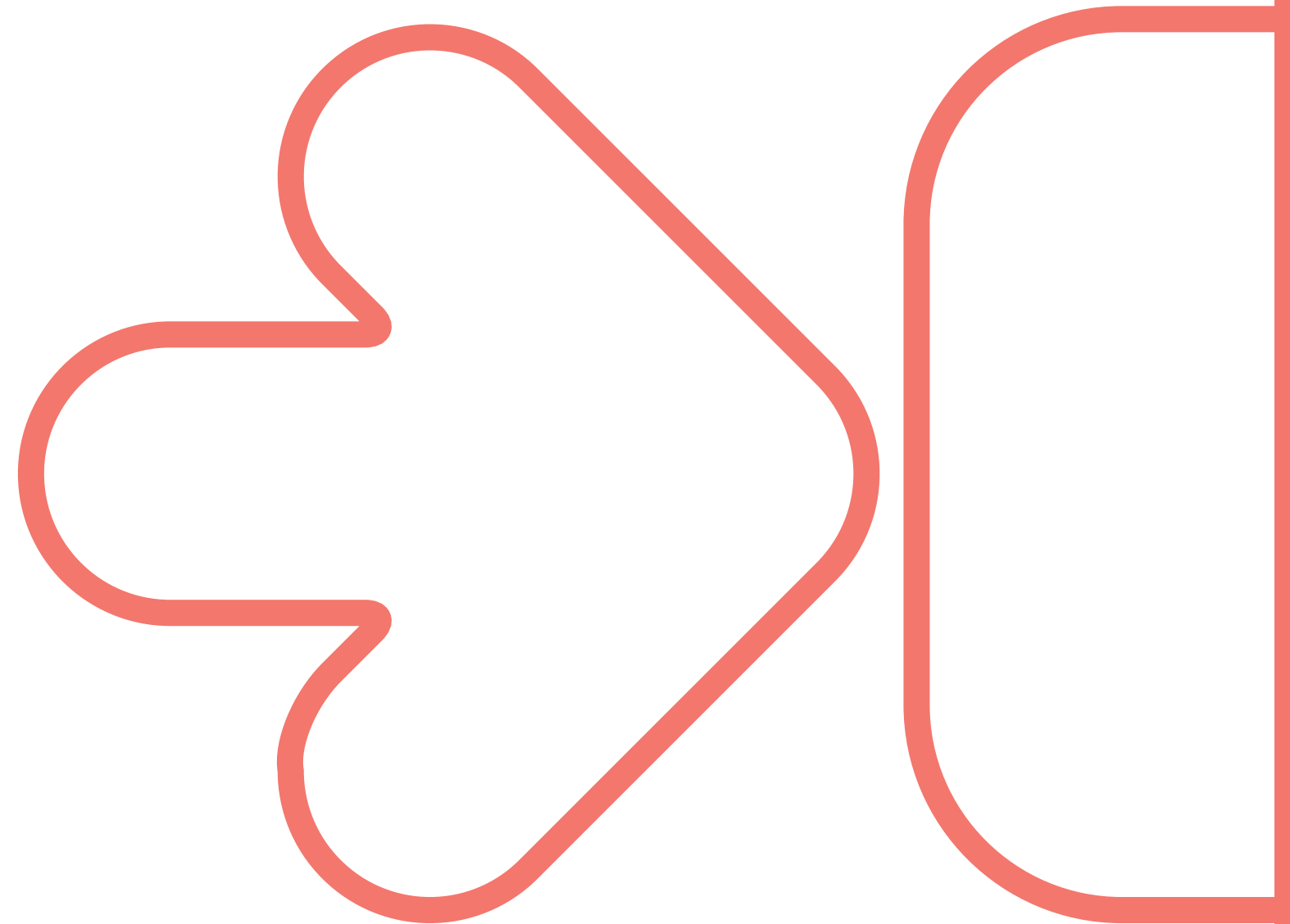


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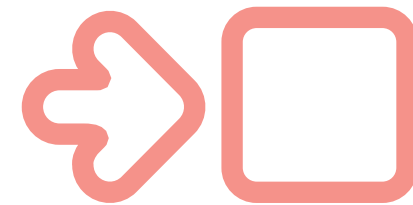
Animation Add-on Teacher Guide



Animation

Animation Add-on

Code to animate



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Editors: Mike Washburn, Ramy Ghattas, Jie Zhou
Curriculum Authors: Amy Matta, Mina Shenouda
Design & Illustration: Justin Tiger Reinsma

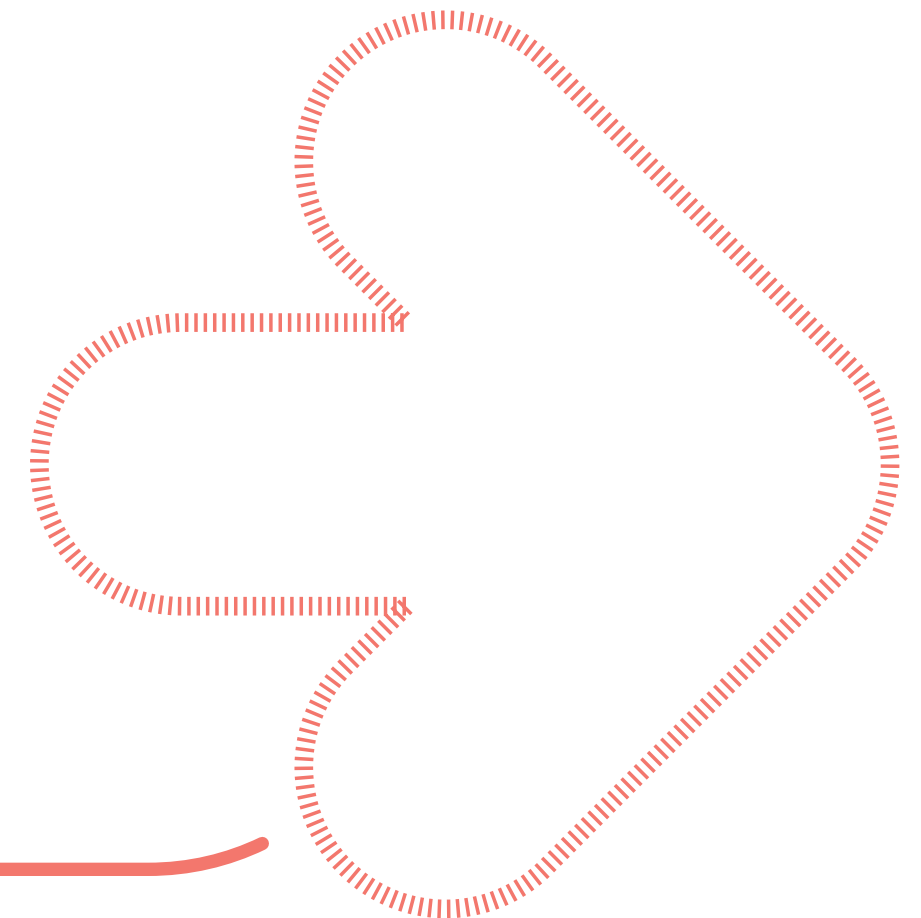


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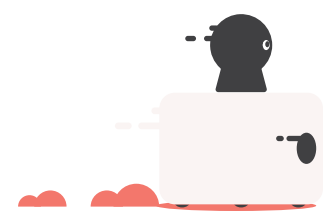


How to Use This Book

Welcome! We've worked incredibly hard to make this book not only fun to read but easy to follow and understand. If you've written or delivered a lesson plan before, none of the sections of this guide should be unfamiliar to you. Each lesson has four sections: Introduction, Guided Practice, Independent Practice, and Wrap Up. By working this way, students are engaged right at the start with a fun conversation to prepare them for what is to come. Guided Practice gives you the opportunity to demonstrate a skill or technique you will be using in this lesson. Independent Practice is when we expect your students to take what they have observed and discussed and do it on their own. Finally, in Wrap Up,

we summarize the learning experience, talk about successes and challenges, and what might be next in the learning process. We've taken the time to provide some ideas on how you can both modify and extend the learning. We've also added a rubric you can use for assessment. In the back of the book, we've aligned each lesson to Common Core, ISTE, CSTA and all the Canadian Provincial Learning Objectives that apply. We've also provided for you some great videos and resources you can use along the way. We hope you love these lessons as much as we do, and we can't wait to see all the great work you do!

Lets Go! 



Costume Party

Lesson 01

Grades K - 3 60 mins

MatataBot makes a costume and brings a tune and dance moves to a costume party! Code and draw custom rectangular shells to wrap around MatataBot to create a spectacular costume. Then code a dance to your favourite tune and bring those moves to the party for a dance-a-thon.

Learning standards found on Pg. 137



Costume Party

Grades K - 3

60 mins

Create student groups of 2 except where groups of 3 are required or beneficial to the student.

Groups will work on a flat surface - floor or table. Allow ample space for each group to work with their MatataBot set along with a drawing area. Students groups should be placed considerately to allow students to walk back and forth to gather their materials. Assign a designated area for the dance-a-thon.

Big ideas & essential questions

Students will experience a hands on geometric relationship between 2-D and 3-D objects. When they measure the circumference of MatataBot to customize the costume, they should conclude that unrolling the circumference of a circle, will result in the equivalent length of a line. They will also see that the side of a cylinder is a rolled up rectangle.

How can we create a custom fitted costume for MatataBot?

Considering standard and nonstandard units, how will you measure MatataBot to get a good fit? Students will be able to choose a unit of measure and apply their understanding of how to repeat the unit to measure around an object.

Measuring is an acquired skill that the students are still exploring and experiencing in a very direct way with this lesson.

Will the costume fit exactly once around MatataBot?

Which design did you choose and why: an overlapping costume or one that fits only partially around?

Due to MatataBot's unit length of a one second forward movement, students must decide if their costume design is best suited for a fit that is mostly around or have an overlap.

Lesson 01

Learning outcomes

TSWBAT : the students will be able to:

- 1) Choose standard or nonstandard units to measure 3-D objects and 2-D shapes.
- 2) Recognize and apply the relationship between the properties of 3-D objects and 2-D shapes.
- 3) Code customized 2-D shapes to fit a 3-D object.
- 4) Code various movements to create a dance.

What you'll do



Each pair of students will investigate, measure and code together and will have MatataBot draw a custom rectangular shell that will wrap around MatataBot. Afterwards, they will decorate the costume by adding colour, legs, wheels, ears, other decorative materials, etc.. Choose the tune(s) that will be played at the dance-a-thon and have each group code a dance using animation movements and lights.

What you'll need

- > Class set of Matatalab Pro Set and Animation Add-On set
- > Markers for MatataBots
- > Markers, stickers, glitter, stick-on gems, ribbons, etc for decorating
- > Scissors
- > Tape, glue
- > Pencils
- > Projector with tablet or computer
- > Coloured construction paper or white copy paper for each group to create a costume shell
- > Rulers
- > String, pipe cleaners, twist ties for non-standard measurement of MatataBot circumference
- > Prepare a sample costume for MatataBot that can easily be attached and detached from MatataBot

Prior to lesson

- > MatataBots and Command Towers should be updated as per MatataBot Firmware Upgrade.
- > Refer to User Guide for MatataBot and Command Tower on/off and connection instructions.
- > Lay out MatataBot Pro and Animation add-on sets, and other materials so they are easily accessible for students. Set up projector with tablet or computer.
- > During the dance-a-thon, have an extra "DJ" board & command tower in the stage area where students can add their own music code for spot light performances or you can have a class song that you co-create for everyone to dance to at the same time.

Introduction

5 mins

- 1) Your MatataBots have been invited to a costume party today! You will help MatataBot dress up in a fantastic costume and code some dance moves for a dance-a-thon!
- 2) Let's take a good look at MatataBot to decide how we can create a costume. Any ideas?
- 3) Let's take a look at the shape of it. What shape is MatataBot? What size is MatataBot?
 - a) Use these questions and student input to direct them to figure out that the shape is a 3-D cylinder and to identify the 2-D shapes they see on MatataBot (a circle on top and bottom).
- 4) How can you find out MatataBot's size to create the costume? Can we use a ruler to measure around MatataBot?
- 5) What would be a good way to measure around MatataBot? Lead a brief discussion on non-standard units.
- 6) Do you think a ruler is a good measuring tool for this situation? It is a standard unit of measurement. What are the units on a ruler?

Guided practice

10 mins

- 1) Show the students your sample costume and how it attaches to MatataBot. Make the costume so that it can unravel to reveal its rectangular shape and relate the circumference to the length of the long rectangular side of the shell.
- 2) Once they figure out the size (length of the long and short side of the rectangle) that the shell should/can be, guide their discussion on how they would use the **Angle**, **Set Speed**, **Stop Wheel** and **Wait** blocks to code and draw it. **Angle** blocks will allow for simple coding of 90 degree turns.
- 3) Model and review the different **Set Speed**, **Stop the Right / Left Wheel** blocks along with **Wait** blocks and how to combine them with **Number** blocks (ask students about the relevance of these blocks) to vary the length of a line. The shortest length will have no **Number** blocks (one second), but the drawn line gets longer as you place a 2, 3, 4, or 5 **Number** block under the **Wait** block.

- 4) **You can also show the video clip How does it work Animation Add on... (series 2)** [1:38 - 3:35]
Youtube- <http://bit.ly/wait-blocks>
- 5) How can we shorten our coding sequence? Review **Loop Begins / Ends blocks** and find and use the core pattern in the code sequence.
- 6) Review how to use the **Right / Left LED Color blocks**:
How does it work Animation Add on... (series 3)
Youtube- <http://bit.ly/light-blocks-1>

Independent practice

35 mins

Challenge 1 15 mins

- > Challenge the students to measure, using non-standard units, MatataBot's circumference and use that information to code MatataBot to draw a rectangular shell.
- > Test the code without the marker at first to make sure the code is correct and that MatataBot does not drive off the paper.
- > They should cut out and decorate the shell and can even add ears, accordion arms/ legs, wheels, etc.

Challenge 2 20 mins

- > It's time to create a dance but first they need to choose music! Students can choose a song, from the Pro set (Preset Music block), or the students can create their own song using the Melody blocks, Alto Clef Music blocks, and/or Treble Clef Music blocks.
- > If they will be performing individually, they can take their board with their coded song and Command Tower to the DJ area to play their request as their MatataBot dances.
- > If you will co-create one song for everyone to dance to, then have the music playing on the DJ Control Board while they code dance moves for the dance-a-thon.
- > Have students add **Right / Left LED Color** blocks to show expression while MatataBot is dancing! Change the intensity of the light sequence by using **Number** blocks.
- > Enjoy the dance-a-thon or individual spotlight performances!

Wrap up

5 mins

- 1) Students will carefully put away all MatataBot components and other materials.
- 2) Ask the following questions:
 - > What tool did you use to measure MatataBot's circumference?
 - > What did you do with that information?
 - > How did you code the costume shell/rectangle?
 - > What was difficult about this project?
 - > What was your favourite dance move?

Interdisciplinary & 21st century connections

This lesson can be used in Mathematics to help teach topics within Geometry and Spatial sense (relating properties of 2-D figures to 3-D objects) as well as Science and Technology. This lesson could also be co-taught with another content area teacher.

21st Century Skills include:

- > Critical thinking
- > Creativity
- > Collaboration
- > Communication
- > Technology literacy
- > Flexibility
- > Leadership
- > Initiative
- > Productivity
- > Social Skills

Modifications

For younger students, co-create coding of the rectangle shell and keep coding model available for students to copy and implement.

Students can use the square artist warm-up card and the **Directional** blocks from the Pro set to help them get started on coding the rectangle.

Accommodations

- > Pair student heterogeneously to optimize co-teaching of prior knowledge.
- > Place student in a group of 3.
- > Allow student to work alone and independently experiment with animation blocks or the artist warm-up card.
- > Student can code the song for the dance-a-thon or choose the song for the individual dance for their group.

Extension activities:

- > Add another shape to the basic rectangular shell such as a triangle, circle, star, or students can create their own shape. Create a stage area for the dance-a-thon.

Supporting files & links

Wait Blocks, How does it work Animation Add on...(series 2) [1:38 - 3:35]
Youtube- <http://bit.ly/wait-blocks>

Light Blocks, How does it work Animation Add on...(series 3)
Youtube- <http://bit.ly/light-blocks-1>

Teaching Big Ideas in Math, Marion Small
Document- <http://bit.ly/big-ideas-1>

Guides to Effective Instruction in Mathematics Grades 1 to 3
Document- <http://bit.ly/math-guide-1-to-3>

Erikson Institute Early Math Collaborative, Big Ideas
Website- <http://bit.ly/early-learning-erikson>

Firmware Upgrade:
Matatalab- <http://bit.ly/upgrade-firmware>

Set Wheel Blocks, Drawing Circles, How does it work Animation Add on... (series 1)
Youtube- <http://bit.ly/set-wheel-blocks>

Assessment

Student's work will be assessed in the following manner:

- > Students are able to identify the critical thinking involved in determining how to measure the circumference of the MatataBot using non-standard units.
- > Students are able to identify, using sufficient evidence of understanding and knowledge, the translation of the circumference of a cylinder to the length of the side of a rectangle.
- > Students are able to identify, using mathematical vocabulary, the 2-D faces on 3-D objects.
- > Students are able to communicate sufficient understanding and knowledge of their coding logic to create 2-D shapes.
- > Students collaborated successfully with their partner(s) to complete the costume shell and dance.

Category/Level Criteria	Level 1 Poor performance	Level 2 Needs improvement	Level 3 Adequate	Level 4 Excellent
Computational Thinking	Demonstrates limited ability to: <ul style="list-style-type: none"> Break a complex problem down into smaller problems. (Decomposition) Create a simple set of steps to solve the problem. (Algorithms) Describe the solution and apply lessons to future solutions. (Abstraction) 	Demonstrates some ability to: <ul style="list-style-type: none"> Break a complex problem down into smaller problems. (Decomposition) Create a simple set of steps to solve the problem. (Algorithms) Describe the solution and apply lessons to future solutions. (Abstraction) 	Demonstrates considerable ability to: <ul style="list-style-type: none"> Break a complex problem down into smaller problems. (Decomposition) Create a simple set of steps to solve the problem. (Algorithms) Describe the solution and apply lessons to future solutions. (Abstraction) 	Demonstrates exceptional ability to: <ul style="list-style-type: none"> Break a complex problem down into smaller problems. (Decomposition) Create a simple set of steps to solve the problem. (Algorithms) Describe the solution and apply lessons to future solutions. (Abstraction)
Communication	Demonstrates limited ability to: <ul style="list-style-type: none"> Share thoughts and ideas with co-workers in order to solve problems. Share with the teacher their learning through explanation and demonstration. 	Demonstrates some ability to: <ul style="list-style-type: none"> Share thoughts and ideas with co-workers in order to solve problems. Share with the teacher their learning through explanation and demonstration. 	Demonstrates considerable ability to: <ul style="list-style-type: none"> Share thoughts and ideas with co-workers in order to solve problems. Share with the teacher their learning through explanation and demonstration. 	Demonstrates exceptional ability to: <ul style="list-style-type: none"> Share thoughts and ideas with co-workers in order to solve problems. Share with the teacher their learning through explanation and demonstration.
Collaboration	Demonstrates limited ability to: <ul style="list-style-type: none"> Work with other group members. Share materials, devices, and time appropriately. Complete tasks in a group due to disruptive behavior. 	Demonstrates some ability to: <ul style="list-style-type: none"> Work with other group members. Share materials, devices, and time appropriately. Complete tasks in a group (some disruptive behavior). 	Demonstrates considerable ability to: <ul style="list-style-type: none"> Work with other group members. Share materials, devices, and time appropriately. Complete tasks in a group Friendly and is somewhat a leader. 	Demonstrates exceptional ability to: <ul style="list-style-type: none"> Work with other group members. Share materials, devices, and time appropriately. Complete tasks in a group Extremely friendly and acts as a leader.
Coding challenges	Demonstrates limited ability to: <ul style="list-style-type: none"> Complete identified coding challenges. Stay on task (cannot stay on task). Complete extension activities as time permits. 	Demonstrates some ability to: <ul style="list-style-type: none"> Complete identified coding challenges. Stay on task most of the time. Complete extension activities as time permits. 	Demonstrates considerable ability to: <ul style="list-style-type: none"> Complete identified coding challenges. Stay on task Complete extension activities as time permits. Find other ways to complete challenges. 	Demonstrates exceptional ability to: <ul style="list-style-type: none"> Complete identified coding challenges. Stay on task Complete extension activities as time permits. Find other ways to complete challenges. Going over and beyond, creatively, in completing challenges.
Independent Practice	Demonstrates limited ability to: <ul style="list-style-type: none"> Work with their partner (very disruptive behaviour). Stay focused on completing tasks (cannot focus). 	Demonstrates some ability to: <ul style="list-style-type: none"> Work with their partner (some disruptive behaviour). Stay focused on completing tasks (some focus). 	Demonstrates considerable ability to: <ul style="list-style-type: none"> Work with their partner (little disruptive behaviour). Focus on completing tasks. Somewhat engaged in tasks. 	Demonstrates exceptional ability to: <ul style="list-style-type: none"> Work with their partner (no disruptive behaviour). Focus on completing tasks. Fully engaged in tasks.

Working on the Railroad

Lesson 02

Grades K - 1 *60 mins*

Choo! Choo! Chugga, Chugga! All Aboard! Make a giant classroom train track! Create straight, curvy and turning railroad paths. Decorate the scenery and add mapping details - legend, compass rose, and landmarks to bring the scene to life. Then code all the MatataBots to chug along the path and see where it takes you!

Learning standards found on Pg. 141



Working on The Railroad

Grades K - 1

60 mins

Create student groups of 2 except where groups of 3 are required or beneficial to the student.

Groups will work on a flat surface - floor or table. Allow a safe space for each group to work around a sheet of craft paper and their MatataBot set.

Students groups should be placed considerately to allow students to walk back and forth to gather their materials.

Consider having this lesson in the gym so that the railroad track is free to meander in a large space.

Big ideas & essential questions

Transportation connects people to people and people/things to places. They not only move people but also the things we need to eat, build with and buy.

What is the purpose of a train?

Why is transportation important?

How is a railroad track constructed? Most students will have a familiar schema of what a track and train look like but will now be able to relate the purpose of materials and construction of a track.

Where do trains travel? Trains require land or bridges to travel on. They can travel through prairies, cities, mountains, forests, etc. Each area has a specific characteristic.

Learning outcomes

TSWBAT : the students will be able to:

- 1) Describe and identify different types of trains.
- 2) Understand the purpose of transportation.
- 3) Complete a map of a specific type of terrain that the railroad must travel through.
- 4) Identify parts of the railroad track.

What you'll do



Each group will create a section of the railroad track so that it begins and ends near the edge of the paper. This way, you will be able to connect each paper track together to create a large track!

Each group will code to create either a straight, curvy or turning railroad path. They will choose a specific landscape genre and decorate the scenery. Lastly, add mapping details - legend, compass rose, and landmarks to bring the scene to life. Then code all the MatataBots to chug along the path and see where it takes you!

What you'll need

- > Class set of Matatalab Pro set and Animation Add-On set
- > Markers for MatataBots
- > Projector and display screen along with computer/tablet
- > Roll of White Craft Paper, one sheet per student group
- > Markers and/or crayons
- > Pencils
- > Scissors
- > Extra white or scrap paper for sketching their ideas
- > Rulers
- > Lego people
- > Lots of tape to tape down corners of the paper while MatataBot draws and to tape the sheets together at the end
- > Prepare a basic sample showing only three different types of railroad track: curvy, turning and straight. It should also show how the track should begin near an edge and end near an edge (either a different edge or the same edge)

Prior to lesson

- > MatataBots and Command Towers should be updated as per MatataBot Firmware Upgrade.
- > Refer to User Guide for MatataBot and Command Tower on/off and connection instructions..
- > Set up projector with tablet or computer.
- > Download videos and pictures ahead of time.
- > Lay out MatataBot Pro and Animation add-on sets, and other materials so they are easily accessible for students.
- > With the series of three MatataBot videos familiarize yourself with the series of three MatataBot videos located below in the External Resources so you can demonstrate straight, curvy or turning path codes.
- > If using a roll of craft paper, precut one sheet per student group.

Introduction

5 mins

- 1) Show the image of the **My Big Train Book**, by Roger Priddy, and ask students which type of train have they been in.
- 2) **My Big Train Book**, by Roger Priddy
Book- <http://bit.ly/working-railroad-1>
- 3) What is the purpose of a train? How do you use one? How does it work?
- 4) Review the different parts of a railroad track (metal rails, wooden crossties, metal fasteners, ballast material) using this picture:
Definition of Basic Track Elements
Website- <http://bit.ly/working-railroad-2>

Guided practice

10 mins

- 1) While displaying your sample, model and review some guidelines for coding each type of railroad section - straight, turning or curvy.
- 2) Model and review the different **Set Speed**, **Stop the Right/Left Wheel** blocks along with **Wait** blocks and how to combine them with **Number** blocks (ask students about the relevance of these blocks). The shortest line length will have no **Number** blocks (one second), but the drawn line gets longer as you place a 2, 3, 4, or 5 **Number** block under the **Wait** block. **Angle** blocks will allow for simple coding of turns.
- 3) You can also show the video clip, **How does it work Animation Add on... (series 2)** [1:38 - 3:35]
Youtube- <http://bit.ly/wait-block>

Independent Practice

40 mins

- 1) Each group will design a section of railroad track and decide on what kind of landscape/terrain their track is passing through by adding mapping details such as landmarks, compass rose, etc.

- 2) Use the extra paper to draw your sketch of what you are going to code MatataBot to draw. You can also use this paper for MatataBot drawing practice.
- 3) Tape down the corners of the drawing paper to keep it in place as MatataBot draws. Practice without the MatataBot marker first to make sure the shape will be drawn where you want it and so that MatataBot does not drive over the edge of the paper.
- 4) Experiment and practice coding different kinds of lines, curves and turns.
- 5) Once MatataBot draws the initial track line, they need to have MatataBot draw it again a few inches away from the first one so that it looks like a path that is wide enough for a MatataBot to traverse. They can use a ruler or freehand to draw the railroad crossties.
- 6) When their drawing is completed, students may code their MatataBot to travel their length of track. Add the Right/Left LED Color blocks and maybe a few Alto or Treble Clef music blocks for added animation.
- 7) Place each completed section of track end-to-end to create a large track around the gym or classroom. Tape them together.
- 8) When the conductor is ready, start your MatataBot train engines and watch all the trains travel their part of the track.

Wrap up

5 mins

- 1) Students will carefully put away all MatataBot components and other materials.
- 2) Why does a railroad track curve or turn sometimes?
- 3) Which type of track did you code?
- 4) What is the purpose of a train?

Interdisciplinary & 21st century connections

This lesson can be used in Science and Technology and Social Studies. This lesson could also be co-taught with another content area teacher so that student drawings are created to reflect relevant content on their maps.

21st Century Skills include:

- > Critical thinking
- > Creativity
- > Collaboration
- > Communication
- > Flexibility
- > Leadership
- > Initiative
- > Productivity
- > Social Skills
- > Technology literacy

Modifications

Students can practice using the Animation coding blocks to observe their outputs and work towards creating a single line of railroad.

Have a small group of students co-create code with you at one MatataBot/Control Board/Command Tower station. They can bring over their Control Board, copy the code and take the board back to their station.

Accommodations

- > Pair student heterogeneously to optimize co-teaching of prior knowledge.
- > Place students in a group of 3.
- > Allow the student to work alone and independently experiment with Animation blocks.

Extension activities:

- > Each group will tell/write one or two sentences about their scenery as the MatataBot's chug through!
- > Add building blocks to create a tunnel through a mountain or the sides of a bridge over a river.

Supporting files & links

My Big Train Book, by Roger Priddy
Book- <http://bit.ly/working-railroad-1>

Definition of Basic Track Elements
Website- <http://bit.ly/working-railroad-2>

Definition of Ballast
Wikipedia- <http://bit.ly/working-railroad-3>

Firmware Upgrade:
Matatalab- <http://bit.ly/upgrade-firmware>

Set Wheel Blocks, Drawing Circles, How does it work Animation Add on... (series 1)
Youtube- <http://bit.ly/set-wheel-blocks>

Wait Blocks, How does it work Animation Add on... (series 2) [1:38 - 3:35]
Youtube- <http://bit.ly/wait-block>

Light Blocks, How does it work Animation Add on... (series 3)
Youtube- <http://bit.ly/light-blocks-1>

Assessment

Student's work will be assessed in the following manner:

- > Students are able to communicate evidence of their critical thinking to determine the algorithm of coding blocks to draw various lines, curves and turns.
- > Students are able to communicate the purpose of this type of transportation.
- > Students showed evidence of completing at least one line of the railroad path.
- > Students demonstrated their knowledge of the components of a map.

City Planner

Grades 2 - 3 60 mins

Matata Town is a new city that you create! With each group creating a section of a town, they will take into consideration the impact on the environmental features of that land.

Test out the new infrastructure and drive Lego people on MatataBot cars through the town using proper signaling and stopping to get through a typical MatataBot day.

Learning standards found on Pg. 144



Category/Level Criteria	Level 1 Poor performance	Level 2 Needs improvement	Level 3 Adequate	Level 4 Excellent
Computational Thinking	Demonstrates limited ability to: <ul style="list-style-type: none"> Break a complex problem down into smaller problems. (Decomposition) Create a simple set of steps to solve the problem. (Algorithms) Describe the solution and apply lessons to future solutions. (Abstraction) 	Demonstrates some ability to: <ul style="list-style-type: none"> Break a complex problem down into smaller problems. (Decomposition) Create a simple set of steps to solve the problem. (Algorithms) Describe the solution and apply lessons to future solutions. (Abstraction) 	Demonstrates considerable ability to: <ul style="list-style-type: none"> Break a complex problem down into smaller problems. (Decomposition) Create a simple set of steps to solve the problem. (Algorithms) Describe the solution and apply lessons to future solutions. (Abstraction) 	Demonstrates exceptional ability to: <ul style="list-style-type: none"> Break a complex problem down into smaller problems. (Decomposition) Create a simple set of steps to solve the problem. (Algorithms) Describe the solution and apply lessons to future solutions. (Abstraction)
Communication	Demonstrates limited ability to: <ul style="list-style-type: none"> Share thoughts and ideas with co-workers in order to solve problems. Share with the teacher their learning through explanation and demonstration. 	Demonstrates some ability to: <ul style="list-style-type: none"> Share thoughts and ideas with co-workers in order to solve problems. Share with the teacher their learning through explanation and demonstration. 	Demonstrates considerable ability to: <ul style="list-style-type: none"> Share thoughts and ideas with co-workers in order to solve problems. Share with the teacher their learning through explanation and demonstration. 	Demonstrates exceptional ability to: <ul style="list-style-type: none"> Share thoughts and ideas with co-workers in order to solve problems. Share with the teacher their learning through explanation and demonstration.
Collaboration	Demonstrates limited ability to: <ul style="list-style-type: none"> Work with other group members. Share materials, devices, and time appropriately. Complete tasks in a group due to disruptive behavior. 	Demonstrates some ability to: <ul style="list-style-type: none"> Work with other group members. Share materials, devices, and time appropriately. Complete tasks in a group (some disruptive behavior). 	Demonstrates considerable ability to: <ul style="list-style-type: none"> Work with other group members. Share materials, devices, and time appropriately. Complete tasks in a group Friendly and is somewhat a leader. 	Demonstrates exceptional ability to: <ul style="list-style-type: none"> Work with other group members. Share materials, devices, and time appropriately. Complete tasks in a group Extremely friendly and acts as a leader.
Coding challenges	Demonstrates limited ability to: <ul style="list-style-type: none"> Complete identified coding challenges. Stay on task (cannot stay on task). Complete extension activities as time permits. 	Demonstrates some ability to: <ul style="list-style-type: none"> Complete identified coding challenges. Stay on task most of the time. Complete extension activities as time permits. 	Demonstrates considerable ability to: <ul style="list-style-type: none"> Complete identified coding challenges. Stay on task Complete extension activities as time permits. Find other ways to complete challenges. 	Demonstrates exceptional ability to: <ul style="list-style-type: none"> Complete identified coding challenges. Stay on task Complete extension activities as time permits. Find other ways to complete challenges. Going over and beyond, creatively, in completing challenges.
Independent Practice	Demonstrates limited ability to: <ul style="list-style-type: none"> Work with their partner (very disruptive behaviour). Stay focused on completing tasks (cannot focus). 	Demonstrates some ability to: <ul style="list-style-type: none"> Work with their partner (some disruptive behaviour). Stay focused on completing tasks (some focus). 	Demonstrates considerable ability to: <ul style="list-style-type: none"> Work with their partner (little disruptive behaviour). Focus on completing tasks. Somewhat engaged in tasks. 	Demonstrates exceptional ability to: <ul style="list-style-type: none"> Work with their partner (no disruptive behaviour). Focus on completing tasks. Fully engaged in tasks.

City Planner

Grades 2 - 3

60 mins

Create student groups of 2 except where groups of 3 are required or beneficial to the student.

Groups will work on a flat surface - floor or table. Allow a safe space for each group to work around a sheet of craft paper and their MatataBot set. Students groups should be placed considerately to allow students to walk back and forth to gather their materials.

Consider having this lesson in the gym so that the Matata Town map is free to meander in a large space.

Big ideas & essential questions

Planning a city is not just about building houses and roads, it is about trading resources of the natural environment for our own purposes and needs. How can we minimize our impact on the natural environment while also meeting our needs?

What environmental features must we consider when planning a new town?

Sometimes natural features of the land dictate how and where we live (oceans, mountains, deserts, etc). Sometimes, the way we live dictates how we change the natural features to accommodate our needs. How can we balance our needs and respect the natural environment?

Learning outcomes

TSWBAT : the students will be able to:

- 1) Describe and identify different types of environmental features and natural resources.
- 2) Understand the purpose and impact of infrastructure.
- 3) Create a map showing specific environmental features.
- 4) Describe how urban areas affect those environmental features.

Lesson 03

What you'll do



Each group will create a section of a town with consideration of the environmental features of that land and drive their MatataBot and driver through the town using proper signaling and stopping to get through a typical MatataBot day.

What you'll need

- > Class set of Matatalab Pro set and Animation Add-On set
- > Markers for MatataBots
- > Projector and display screen along with computer/tablet
- > Extra white paper or scrap paper to sketch a plan
- > Markers and/or crayons
- > Pencils
- > Scissors
- > Roll of white craft paper, one sheet per student group
- > Rulers
- > Lego people
- > Lots of tape to tape down corners of the paper while MatataBot draws and to tape the sheets together at the end
- > Prepare a sample showing an environmental feature and how people create infrastructure around that feature or change that feature to accommodate the infrastructure. It should also show how the road should begin near an edge and end near an edge (either a different edge or the same edge).

Prior to lesson

- > MatataBots and Command Towers should be updated as per MatataBot Firmware Upgrade.
- > Refer to User Guide for MatataBot and Command Tower on/off and connection instructions.
- > Set up Projector with tablet or computer.
- > Download videos and pictures ahead of time.
- > Lay out MatataBot Pro and Animation add-on sets, and other materials so they are easily accessible for students.
- > With the series of three MatataBot videos Familiarize yourself with the series of three MatataBot videos located below in the External Resources so you can demonstrate straight, curvy or turning path codes.
- > If using a roll of craft paper, precut one sheet per student group.
- > Remove the amber half globe of MatataBot's magnetic top to reveal the Lego connectors.

Introduction

5 mins

- 1) In our province/state, what are the natural resources and environmental features (climate, terrain, water, etc?).
- 2) What do humans need to live on the land?
- 3) What must be considered when deciding on the best place for homes or industry?
- 4) How do these decisions impact the environment?

Guided practice

10 mins

- 1) While displaying your sample, model and review some guidelines for coding each type of road section - straight, intersecting, turning or curvy.
- 2) The roads should stop just shy of the edge of the paper so that MatataBot does not draw on the floor, yet, you will still be able to connect each paper together to create a large town.
- 3) Model and review the different **Set Speed**, **Stop the Right / Left Wheel** blocks along with **Wait** blocks and how to combine them with **Number** blocks (ask students about the relevance of these blocks).
- 4) The shortest length will have no **Number** blocks (one second), but the drawn line gets longer as you place a 2, 3, 4, or 5 **Number** block under the **Wait** block. **Angle** blocks will allow for simple coding of turns.
- 5) You can also show the video clip, **How does it work Animation Add on... (series 2)** [1:38 - 3:35] Youtube- <http://bit.ly/wait-blocks>

Independent Practice

40 mins

- 1) Using sketch paper to formulate their design ideas, each group must first decide on the environmental features that existed before the town, like mountains, rivers, lakes, forests, marshland, prairies, farms, etc.
- 2) Next decide on the infrastructure (homes, roads, stores, industry, farms, parks, schools, etc) that the town needs to serve the people that will live there.

- 3) To begin to create the city map, it should show the environmental features (that they can draw themselves) and consider how that preexisting land is going to be transformed into urban development.
- 4) Tape down the corners of the drawing paper to keep it in place as MatataBot draws. Practice without the MatataBot marker first to make sure the line will be drawn where you want it and so that MatataBot does not drive over the edge of the paper. Experiment and practice coding different kinds of lines, curves and turns.
- 5) Then each group will code to create either a straight, curvy, intersecting or turning two-way street. It should include cross walks, stop signs and traffic lights. Lastly, add mapping details - legend, compass rose, and landmarks to bring the scene to life.
- 6) They will then program the MatataBot to drive a Lego person through their section of the new community watching for traffic lights, stop signs and pedestrians, even stopping at stores or restaurants!
- 7) Add the **Right/Left LED Color** blocks for added animation.
- 8) Place each completed section of road end-to-end to create a large town around the gym or classroom. Tape them together.
- 9) When the sun rises in the morning, the new town will be ready to greet its MatataBot inhabitants as they start their day.

Wrap up

5 mins

- 1) Students will carefully put away all MatataBot components and other materials.
- 2) Describe the natural resources or features of your section of town and how they were impacted after the infrastructure was put in place.
- 3) What surprised you the most about city planning?

Interdisciplinary & 21st century connections

This lesson can be used in Social Studies (environmental impact of communities). This lesson could also be co-taught with another content area teacher such as Science.

21st Century Skills include:

- > Critical thinking
- > Creativity
- > Collaboration
- > Communication
- > Technology literacy
- > Flexibility
- > Leadership
- > Initiative
- > Productivity
- > Social Skills

Modifications

Students can practice using the Animation coding blocks to observe their outputs and work towards creating a single line of road.

Have a small group of students co-create code with you at one MatataBot/Control Board/Command Tower station. They can bring over their Control Board, copy the code and take the board back to their station.

Accommodations

- > Pair student heterogeneously to optimize co-teaching of prior knowledge.
- > Place student in a group of 3.
- > Allow student to work alone and independently experiment with animation blocks.

Extension activities:

- > Add 2 stand up building fronts in 2-D (homes, roads, stores, industry, farms, parks, schools, etc) that represent part of their community streetscape map.
- > If iMovie is accessible, record and edit clips and add narration. Present iMovies to the class at the end, something like a showcase.

Supporting files & links

Firmware Upgrade:

Matatalab- <http://bit.ly/upgrade-firmware>

Set Wheel Blocks, Drawing Circles, How does it work Animation Add on... (series 1)

Youtube- <http://bit.ly/set-wheel-blocks>

Wait Blocks, How does it work Animation Add on... (series 2)

Youtube- <http://bit.ly/wait-blocks>

Light Blocks, How does it work Animation Add on... (series 3)

Youtube- <http://bit.ly/light-blocks-1>

Assessment

Student's work will be assessed in the following manner:

- > Students are able to communicate evidence of their critical thinking to determine the algorithm of coding blocks to draw various lines, curves and turns.
- > Students are able to describe the environmental impact of city planning.
- > Students describe a variety of environmental features and resources.
- > Students have an understanding of human needs .
- > Students demonstrated their knowledge of the components of a map.