



# Bee-Bot

*A Guide for Parents and Educators*

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2018



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## About Bee-Bot



Bee-Bot is a very simple programmable floor robot that can be used in the classroom or at home to help young children learn basic coding and computational thinking concepts. It can also be integrated into learning activities with other subjects and skills such as literacy, numeracy, and spatial reasoning.

### Bee-Bot Stats

Best for Ages (Grades)	2-7 (ECE-2 <sup>nd</sup> )
Motor & Hand-Eye Skills Needed	Press physical button
Language Skills Needed	Recognize & select symbols
Cognitive Skills Needed	Recognize cause & effect patterns (e.g., "If I push this button, the robot reacts in this way")
Use with a Smart Device	Not Supported
Battery Recharge Time	Up to 12 hours
Battery Duration	2-8 hours
Accessories	Accessories, Mats, Curriculum: <a href="http://www.bee-bot.us">www.bee-bot.us</a>
Pricing	<a href="http://www.bee-bot.us/bee-bot.html">www.bee-bot.us/bee-bot.html</a>

## Setup Instructions

### What's In the Box?

The Bee-Bot box contains 3 items: the robot, a power cable, and a small user guide.

## How Bee-Bot Works

Refer to the image below for an explanation of the bee-bot programming language and key functions.

The Bee-Bot programming language consists of only five main commands:

- forward 150mm,
- backward 150mm,
- right 90 degrees,
- left 90 degrees,
- pause for 1 second and make a tick sound;

Plus two device control commands:

- clear, and
- go - executes commands and makes a sound when complete



Figure 1. The Bee-Bot Programming language. Image from <https://barefootcas.org>

**Important:** You need to understand that after Bee-Bot executes a command sequence, any additional command buttons you press will be added (not replace) the current program.

For a little more technical detail, you may also refer to the table below, printed in the Bee-Bot User Guide:

Bee-Bot Specifications	
Forward/Backward Movement	150mm ± 8mm
Left/right turn	90° ± 4°
Pause	1 second ± 15%
Speed of movement (depends on battery condition)	Approx. 65 mm/sec

Batteries (non replaceable)	D.C. 3.7V, 500mAH Lithium Polymer
Battery Life	Approx. 8 hours in normal usage (depends mainly on amount of movement)

As you consider how you might use Bee-Bot in your teaching, it may be useful to you to watch this video that shows what it might look like when young children are using Bee-Bot



**Video 1.** Bee-Bots in the Classroom. Click, copy, or type this link into your browser to view: <https://youtu.be/wcAHpLOOBWA>. CdiZ1J n'kYZd'n'Xdeng\]iZYWihj XXZhh6XVYZb Zhj cYZgV HlVcYVgY'Ndj l j VZ'AXZchZ#i'h'i] ZgZ[dgZ'cdi'cXj YZYi]Z'88"7N'aXZchZ'[dgi] Z'gZhi'd[i] n'YdXj b Zci#

## Charging, Care, & Maintenance of Bee-Bot

The following facts may be useful as you consider how to use Bee-Bot in your classroom and how to ensure it is cared for properly. Some of the following points are summarized from the Bee-Bot User Guide:

Bee-Bot has a rechargeable battery that lasts about 2 hours with continual use and up to 8 hours under normal working conditions. It can take up to 12 hours to fully charge, so you will want to ensure all units are charged the day before classroom use. You may want to keep them plugged in overnight, or even whenever they are not in use. If Bee-Bot is not used for 2 minutes, it will play a sound and go to sleep. Batteries will last a long time in sleep mode. Robots running low on battery will start to slow down and gradually produce a different tone of beep.

Clean Bee-Bot gently with a clean, damp cloth. Do not allow the electrical components to come into contact with water or other liquids.

Keep Bee-bot away from sunlight and heat.

Bee-Bot is durable, but not indestructible. Don't purposely try to make it crash or fall.

It's a good idea to regularly examine the plug, enclosure and other parts.

## Troubleshooting Bee-Bot

Since Bee-Bot is so simple, there are very few issues that may need to be troubleshooted. Refer to the table below, adapted from the Bee-Bot User Guide.

Troubleshooting Bee-Bot	
Problem	Solution
Bee-Bot won't do anything	Ensure Power switch is "On" and batteries are charged.
Lights on, but no movement	Recharge the batteries
No sounds	Ensure "Sound" switch is "ON"
Bee-Bot doesn't travel straight	Look for foreign objects in wheels. Check for smooth patches on wheels.

## Teacher-to-Teacher Tips for Using Bee-Bot in the Classroom

Lay out Bee-Bot mats as flat as possible. Wrinkles in the mat can cause Bee-Bot to steer off-course.

Using Bee-Bot doesn't have to be expensive. You can use a variety of laminated cutouts in the standard mat to integrate the bot with just about any subject.

There are currently other floor robots similar to Bee-Bot on the market for a lower price, but they tend to be fairly inaccurate in the distances they move and turn, which can be problematic for teaching programming.

## Using Bee-Bot in Developmentally-Appropriate Ways

Since Bee-Bot is primarily for use by very young children, it is important to recognize how developmentally-appropriate practice (DAP) applies to the use of this robot. For

most of the decisions you make, you will need to rely on your informed professional judgment to determine if the practice is developmentally-appropriate for your students (NAEYC and Fred Rogers, 6). You may find the following guidelines useful.

**Interactive Use.** Activities in which children use Bee-Bot, like activities with any other technology, should be structured to be *“child-centered.”* In other words, they should encourage both active creativity and “social engagement with other children and adults” (NAEYC and Fred Rogers, 1). You may consider using strategies such as pair programming (<https://youtu.be/vgkahOzFH2Q>) to encourage such interaction. Furthermore, you may consider using the following types of student-teacher interaction, which have been documented in past research studies to produce effective results:

*“Modeling.”* Teachers demonstrate tasks (Highfield, 2015).

*“Scaffolding.”* Start with direct instruction, move to a simple guided activity, then issue an open-ended challenge or problem (Buss and Gamboa, 2017). Continue to guide behavior, even while working/playing as a team (Highfield, 2015).

*“Hints and tips.”* Insofar as possible, teachers should provide “encouragement and problem-solving hints and tips,” rather than outright answers (Buss and Gamboa, 2017).

*“Probing questions.”* Rather than providing answers directly, teachers should ask “probing questions” before, during, and after learning activities (Buss and Gamboa, 2017; See also Highfield, 2015) These questions should encourage students to reflect on their learning (Buss and Gamboa, 2017).

*“Alternative modeling.”* Teachers should promote alternative ways of modeling a problem, such as drawing out solutions on paper, discussing alternative solutions as teams, or relating challenges to more familiar circumstances (Buss and Gamboa, 2017).

**Social Coaching.** Since use of technology such as Bee-Bot needs to be interactive to be developmentally-appropriate, teachers should be aware that they may need to provide social coaching to children in these collaborative activities (Bredekamp and Copple, p. 116).

**Time for Exploration.** Expect toddlers to manipulate the robot and explore its features, but not necessarily to produce complete coded programs at first.

(Bredenkamp and Copple, p. 85). Older children can create complete programs once they are ready. Even for older children, it may be important to provide time to explore and “play” with the robots, allowing them to “follow their own interests” (Bredenkamp and Copple, pp. 127-128).

**Activity Length.** Be aware that children under 4 often fatigue quickly if extended periods of eye-hand coordination are required (Bredenkamp and Copple, 105).

**Sanitation.** Robots and devices should be cleaned appropriately for safety and sanitation (Bredenkamp and Copple, 88).

- **Curriculum Integration.** Using Bee-Bot should not be merely an isolated or “fun Friday” experience. Rather, teachers should integrate the bot into core subjects and help students transfer their learning to other contexts and subject areas (Bredenkamp and Copple, p. 130). Several ideas for integration with other subject areas can be found in the [Cross-Curricular Connections with Bee-Bot](#) section below.

## Teaching Coding with Bee-Bot

You will not be able to instruct children in advanced coding concepts with Bee-Bot, but you can introduce them to programming commands and other concepts that are foundational to coding, such as (but not limited to) the following:

Most computers are good at following commands, but not at interpreting commands. For this reason, programming instructions must be clear and delivered in a language that the robot can comprehend.

It’s ok to make mistakes when creating an algorithm; we simply try again (i.e., “debug”).

It’s useful to play with robots and computer programs (i.e., “tinker”) in order to understand how they work.

Coding can be faster and more accurate when you work with a partner.

Robots are a bridge between the virtual (programming/coding) world and the physical (tangible) world. Because of this, it is easy to make connections between coding and life in the physical world.

## Using Coding & Computational Thinking Vocabulary with Bee-Bot Lessons

Below is a list of important vocabulary and concepts associated with coding and computational thinking instruction. You may find the following explanations useful as you consider how to help children relate their activities with Bee-Bot to broader learning outcomes.

### Coding Concepts

**Commands** are the basic actions that are already built in to a coding language. Bee-Bot has six commands:

- Move forward
- Move backward
- Turn left
- Turn right
- Pause for 1 second
- Clear all commands

When commands are put together in a sequence, they make a program.

**Event** In coding, an event tells your program to detect when some external thing happens and to take an action when it does. Bee-Bot can detect one event: when the “go” button is pressed. This button makes the program start.

### Computational Thinking Concepts

**Decomposition** is dividing a problem into its component parts. When you count how many spaces Bee-Bot needs to move or which direction it needs to turn, you are breaking a problem down so you can solve it better.

**Algorithm** is a set of steps for solving a problem. Coding is creating algorithms that a computer can understand. Consider the image and algorithms provided below:



Figure 2. Using algorithms with Bee-Bot on a mat. Image from Ebay.com

### Example 1:

*EgMzZb* /Get to the flower from the current position.

*6adgt]b* /

1. Forward
2. Turn Right
3. Forward
4. Forward
5. Turn Right
6. Forward
7. Forward

### Example 2:

*EgMzZb* /Get to the purple rosebush from the current position.

*6adgt]b* /

1. Turn left
2. Forward
3. Forward
4. Forward

*I c` Zgt`#* Tinkering means experimenting and playing, usually with quick feedback, in order to understand how something works and make progress in solving a problem. Tinkering is an important computational thinking approach, and can be taught to children as you allow them time to play with Bee-Bot, then guide them through a reflection of their learning.

*9ZVj/\ \ c\#* Debugging means finding and fixing errors in a coding program. In designing the algorithms shown in Figure 2 above, young children are likely to make many errors on first attempts to get a program right. These moments are opportunities to teach them about debugging and how we can fix a program again and again until we get it right.

*EZghZkZgt`#* Persevering means “keeping going.” Debugging moments are also good opportunities to teach children the importance of trying again without getting frustrated.

## Cross-Curricular Connections with Bee-Bot

Bee-Bot is fun on its own and is really great for helping kids learn computational thinking and coding concepts. However, much of Bee-Bot's potential involves integrating these concepts with other aspects of the core curriculum. Whether you are a parent or early childhood educator, learning how to integrate and connect Bee-Bot with other subject areas can be an enriching experience for both you and your students and can help students to transfer their knowledge between domains.

The following series of videos may prove valuable to you as you consider how to connect Bee-Bot Instruction with other topics.



**Video 2.** Bee-Bot®: a class introduction. Click, copy, or type this link into your browser to view:

<https://youtu.be/52ZuenJIFyE>. CdiZ/1 ] h'k'YZd'h'Xdeng\ ] iZY'Vh'i ] Z' ] ZI | H<gIj e'j cYZgV  
H#VcYVgY'Ndj | j VZ'A'XZchZ# 'h'i ] Zg'[dg' cdi 'cXj YZY'i ] Z'88"7N'aXZchZ'[dgi ] Z'g'hi 'd[i ] h'YdXj b Zci#



**Video 3.** Using Bee-Bot for Numeracy. Click, copy, or type this link into your browser to view: <https://youtu.be/za6wHI50fJU>. Cdi Z/1 ] h'k'YZd'h'Xdeng\ ] iZY'Vh'1 ] ZI I H<gIj e'j cYZgV'Hi Vc'YVg' Ndj I j VZ'AXZchZ# 'i' h'i ] Zg'[dg' cdi °cXj YZY'i ] Z'88"7N'aXZchZ'[dgi] Z'g'hi d'[i] h'YdXj b Zci#



**Video 4.** Using Bee-Bot for Literacy. Click, copy, or type this link into your browser to view: <https://youtu.be/ZJaSQgsDQ1w>. Cdi Z/1 ] h'k'YZd'h'Xdeng\ ] iZY'Vh'1 ] ZI I H<gIj e'j cYZgV' Hi Vc'YVg' Ndj I j VZ'AXZchZ# 'i' h'i ] Zg'[dg' cdi °cXj YZY'i ] Z'88"7N'aXZchZ'[dgi] Z'g'hi d'[i] h'YdXj b Zci#



**Video 5.** Bee-Bot in Geography Lessons. Click, copy, or type this link into your browser to view: <https://youtu.be/t-cuvpbCErI>. CdiZ/1 ] h'k'YZd'h'Xdeng\ ] iZY\m'?dVccV'G'8db ej i'c\ ] cYZgV H'VcYVg'Ndj | j VZ'AXZchZ# 'i'h'i] Zg[ dg' cdi 'cXj YZY'i] Z'88"7N'aXZchZ'[dgi] Z'g'hi'd[i] h'YdXj b Zci#

You might also find this Prezi presentation about using Bee-Bot across the curriculum to be helpful:



**Presentation 1.** Bee-Bots Across the Curriculum. Click, copy, or type this link into your browser to view: <http://bit.ly/2KPIQ44>

## Additional Resources

CAS Barefoot's [Bee-Bot Activity Guide](http://bit.ly/2KOhCdX) (<http://bit.ly/2KOhCdX>)

## Teaching with Bee-Bot: Quick Start Guide



About Bee-Bot	
<b>Best for Ages</b>	2-7 (Grades PreK-2 <sup>nd</sup> )
<b>Motor Skills Needed</b>	Press button
<b>Language Skills Needed</b>	Recognize & select symbols
<b>Cognitive Skills Needed</b>	Recognize cause & effect patterns
<b>Battery Duration</b>	2-8 hours
<b>Recharge Time</b>	Up to 12 hours

Troubleshooting	
Problem	Solution
Bee-Bot won't do anything	Ensure Power switch is "ON" and batteries are charged.
Lights on, but no movement	Recharge the batteries
No sounds	Ensure "Sound" switch is "ON"
Bee-Bot doesn't travel straight	Look for foreign objects in or smooth patches on wheels.

Bee-Bot Programming Language	
	<b>Move Forward</b> 150mm
	<b>Move Back</b> 150mm
	<b>Turn Left</b> 90°
	<b>Turn Right</b> 90°
	<b>Pause</b> for 1 second.
	<b>Clear</b> program
	<b>Start</b> program

Teacher-to-Teacher Tips
Lay out Bee-Bot mats as flat as possible before using. Wrinkles can cause the robot to steer off-course.
Use laminated cutouts inside the standard Bee-Bot mat to integrate with a wide variety of disciplines.
Be wary of cheaper floor robots similar to Bee-Bot. They tend to be less accurate.

## References

- Bredekamp, S., & Copple, C., eds. (1997). *Developmentally appropriate practice in early childhood programs*. Revised edition. Washington, D.C: National Association for the Education of Young Children [NAEYC].
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