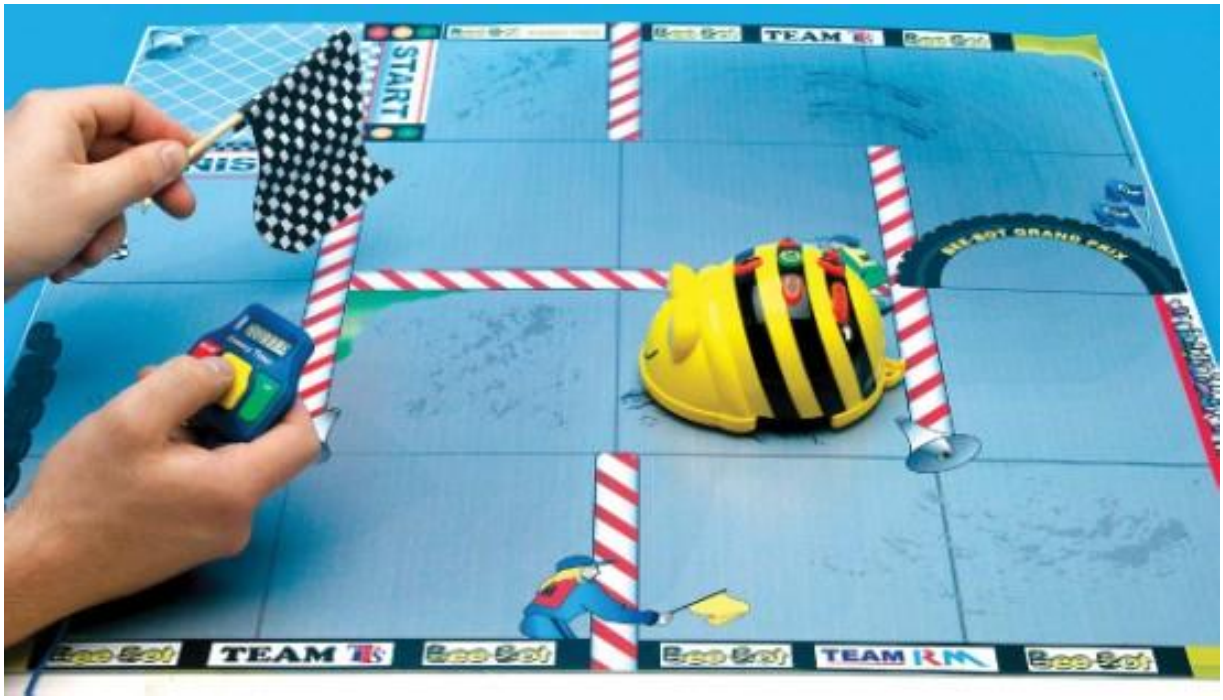
HUTT SCIENCE

SUPPORTING SCIENCE AND TECHNOLOGY EDUCATION

WelTec

BEE-BOTS

TEACHER MANUAL



HOUSE OF SCIENCE

HUTT CITY
TE AWA KAIRANGI

LEARNING OUTCOMES AND CURRICULUM LINKS

Nature of Science (Level 1-2) *Investigating in Science, Participating and Contributing*

Physical World (Level 1-2) *Physical inquiry and physical concepts*

Nature of Technology (Level 1-2) *All themes*

Technological Practice (Level 1-2) *All themes*

Technological knowledge (Level 1-2) *All themes*

Key outcomes	Specific learning intentions
Gain hands-on familiarity with programming a Bee-Bot.	Use the appropriate keys to make the Bee-Bot go forward, backward, left and right when given instructions by the leader.
Develop confidence in operating a programmable toy.	Know that instructions can be sequenced for more complicated tasks.
Progress through developmental steps where remote control devices are used to control certain actions.	Develop and record sequences of instructions to control the Bee-Bot, predict and test results.
Understand that scientists work together to answer their questions, they predict and test their ideas.	Engage in collaborative problem solving. Investigate ways of problem solving by trying out different ideas.
Reflect on the impact of technological advancements on our everyday life.	Engage in discussion about how technology has and can further improve daily life.

TEACHER NOTES:

Introduction to Robotics

This robotics introduction teaches the basics of the robot world, offering robot information covering everything from artificial intelligence to robot mechanics and robots in industries such as car manufacturing and the military.

Definitions:

- What does the word ‘robotics’ mean? - The science or study of the technology associated with the design, fabrication, theory, and application of robots.
- What about ‘robot’? - Robots are any machine that does work on its own, automatically.

Artificial Intelligence:

- What is Artificial Intelligence (AI)? - The ability of a computer or other machine to perform those activities that are normally thought to require intelligence. It is also referred to as the branch of computer science concerned with the development of machines having this ability.

  Some questions to think about:

- Will robots ever really be able to think for themselves?
- Will computers ever be smarter than humans? Are they already?
- Will robots ever pose a threat to humans?

Robot Mechanics:

- As well as programming robots to be as intelligent as possible, scientists also work hard on building robot that can perform a number of complex movements as well as utilizing a variety of sensors.

  Important things to think about:

- Purpose - What is the robot being built to do?
- Materials - What will be used to build the robot? (Plastic, metal etc)
- Joints
- Size

- Center of gravity
- Sensory inputs - Vision, Hearing, Touch, Smell, Taste

Robots in Industry:

- Robots are ideal for doing precise, repetitive or dangerous tasks. Around 90% of robots are used in factories with half of these being used in the automobile industry.

Robots and robotic arms are frequently used for:

- Car manufacturing
- Military - Bomb disposal, weapons, army surveillance
- Medical - Surgery, X-rays, life support
- Space - Shuttles, International Space Station, mars rovers

What are Bee-Bots?

Bee-Bots are programmable floor robots that have been purpose-built for use with Early Phase and Primary students. The following diagram highlights the features of the Bee-Bot.

Bright buttons for the students to use to input instructions.

The ability to remember up to 40 instructions / steps entered by students.

The ability to move accurately in 15cm steps and to turn in 90 degree increments;

Sounds and flashing eyes that let students know that their instructions have been entered.

Operating the Bee-Bot:

Turn the Bee-Bot on with the small black switch underneath. Sound is optional, that's the second switch.

Then program using the buttons on the back:

- forward 15cm
- back 15cm
- turn right 90º
- turn left 90º
- Pause
- Clear the memory

Ideas for using Bee-Bots

Synchronised Buzzing

Bee-Bots love buzzing together. In this activity, students work collaboratively to develop a flight plan for their Bee-Bot. They may draw the path on paper, write down a sequence of instructions or use the Bee-Bot button sequence cards to map out what they want their Bee-Bots to do. Once the students have developed their flight plan, they can program their Bee-Bots and then press go at the same time to see some synchronised buzzing.

I think I can…. I think I can…
The Little Bee-Bot that could.

You may have noticed that every Bee-Bot has a tow bar on their back. You can attach string or rope to the tow bar in order to have the Bee-Bot tow other objects. In this activity, students can investigate the different loads that Bee-Bots can tow and how the weight of the loads can affect the speed of the Bee-Bot. Students can also try placing the Bee-Bot on surfaces placed at different angles to see if the Bee-Bot can carry the load up or down a slope.

How far is it?

In this activity, students work collaboratively to explore how far it is that a Bee-Bot can travel with each step. For this activity, students initially explore how concrete materials can be used as non-standard units of measure. For example, students may estimate and then investigate how many paperclips are needed to represent how far a Bee-Bot moves with each step. Alternatively they may measure the length using a range of other materials such as counters, blocks and matchsticks.

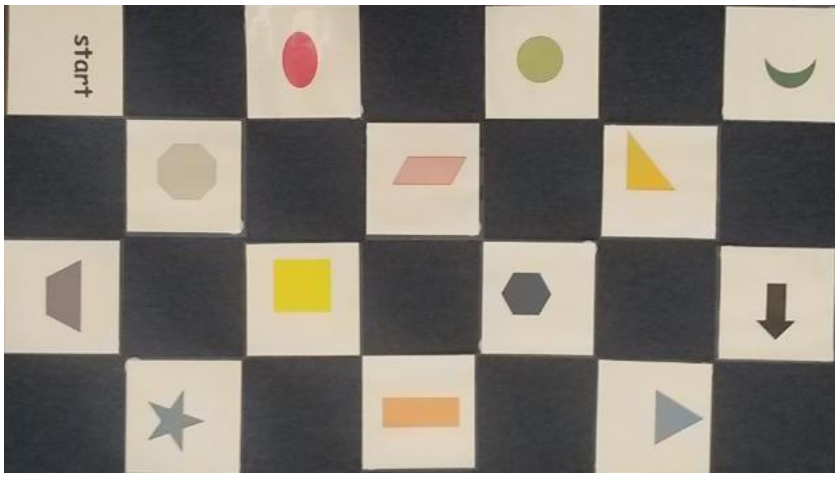
A key part of this activity is the discussion that should take place during the culminating stage. During this discussion, students should be asked to share their findings and can make comparisons relating to the types of non-standard units they used. For example, the students might have discovered that a Bee-Bot moves the length of six paperclips or four blocks. Depending on the level of the students in the class, this can then provide a

starting point to explore standard units of measure and the use of rulers and measuring tapes.

There are also 6 Bee-Bot ‘rulers’ in the kit, these are all 15cm long, the length of one Bee-Bot move.

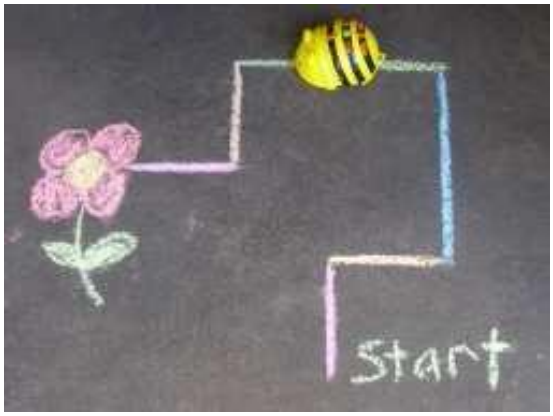
Shape Shifter

Use the square shape cards to lay out a grid on the carpet. This can be as easy or hard as you like:



Now the students draw a small card from the pack and program the Bee-Bot to the correct shape. Note every square shape card is 15cm so equates to one Bee-Bot move.

Bee-Bot Trails



For this activity, take your class outdoors onto a surface where they can do chalk drawings. Divide students into groups of two or three and then give each group a Bee-Bot, some chalk and either a tape measure, ruler or concrete materials they can use as non-standard units. Model the process of designing a Bee-Bot trail, emphasising the importance of measuring the trail to ensure the Bee-Bot can reach and turn at particular points. Ask each group to design a trail that the Bee-Bot can buzz along. Once students have designed their trail, they should test it and then ask other students to get their Bee-Bot to buzz along their trail. During this final part, students will need to work together to estimate how many steps they will need the Bee-Bot to take.

How many Bs can we use with Bee-Bot?

Even the youngest students enjoy exploring alliteration – the repetition of a leading vowel or consonant sound in a phrase. The Bee-Bot name is so catchy because of alliteration and students will enjoy working together to collaboratively develop their own phrases and sentences about Bee-Bots. Examples could include 'Bindy Bee-Bot bakes bread for breakfast' or 'Bonnie Bee-Bot broke Blinky Bee-Bots bright blue balloon'.

Slalom Buzzing

Challenge your students to a Slalom Buzzing race. You can design your own slalom buzzing course around your classroom or have students create their own using either flags they have created using straws, paddlepop sticks and cardboard. Alternatively, for a permanent course, draw your own flags or print out our flag template and then use clear contact to stick them to the classroom floor. In slalom skiing, flags generally alternate between red and blue for each gate. It is recommended that flags are numbered so that the course is clear. Turn this activity into a game by either developing rules or collaboratively brainstorming rules with your class. For example, each student or group could get three attempts to program their Bee-Bot to buzz through the course. They could earn 5 points for each gate they pass through in attempt 1, 2 points for each gate in attempt 2 and 1 point for each gate in attempt 3. The winning team is the team with the most points.

Make a Bee-Bot Course

Provide students with a range of concrete materials such as blocks, boxes and manipulatives and ask students to design a Bee-Bot obstacle course. Students can use rulers or non-standard units of measure to create the course and will need to plan their course to ensure the Bee-Bot can move safely through it. Once completed, students can challenge other students to program Bee-Bots to move through the course.

Guess who?

In this activity, a mat is made containing a photo or drawing of each student in the class. The teacher then picks a student name and proceeds to give the class clues relating to that student. Each time a clue is given, a student is selected to come and program the Bee-Bot to move to the location of the student the student thinks is correct. If correct, that student and the class wins. If incorrect, the game continues until the number of guesses the teacher sets is met or a student moves the Bee-Bot to the correct location.

Clues the teacher provides could include ‘I am a girl / boy’, ‘I have short hair’, ‘I wear glasses’, ‘I like swimming’ etc. This activity also could be done with photos or drawings of members of the school or local community, animals or famous characters. Clues can relate to physical appearance, the role the person takes on within a community or how they move or act.

Turtle Island

To play this game, use some collage materials to transform your Bee-Bot into a turtle. Using the Bee-Bot Treasure Island Mat or (a mat of an island you have made), ask a student to write down the coordinates for the grid location where the turtle has laid its eggs. Ensure that other students don’t see the coordinates. Students are then invited to come up and guess the location of the eggs. They must identify the location by pointing to the spot and saying the coordinates. The student then programs the Bee-Bot to move to that location. Once the turtle arrives at the location, the first students must reveal if the spot is where the eggs were laid. If it is, the student wins the game. Students keep having turns until the eggs are found. To help younger students locate the eggs, the first student or the teacher may provide hot and cold style hints during the game.

Bee-Bot Links

The following websites provide further information and resources relating to Bee-Bots.

Bee-Bot Official Website:
www.bee-bot.co.uk

Bee-Bots Down Under Blog
http://bee-bots-downunder.blogspot.com