Year 1 – Programming A – Moving a robot

Unit introduction

Learners will be introduced to early programming concepts. Learners will explore using individual commands, both with other learners and as part of a computer program. They will identify what each command for the floor robot does, and use that knowledge to start predicting the outcome of programs. The unit is paced to ensure time is spent on all aspects of programming, and builds knowledge in a structured manner. Learners are also introduced to the early stages of program design through the introduction of algorithms.

Software and Hardware requirements

This unit includes references relating to Bee-Bot floor robots, but can be taught using other floor robots. If access to floor robots will prevent you teaching this unit, your local hub may be able to support with a loan kit. Find out more by visiting Physical Computing Kits - Teach Computing.

If you've adapted this unit to better suit your school, please share your adapted resources with fellow teachers in the STEM community. Alternatively, if this unit isn't quite right for your school, why not see if an adapted version which better suits has already been shared?

Overview of lessons

Lesson	**Brief overview**	**Learning objectives**

1 Buttons	Learners will be introduced to floor robots. They will talk about what the buttons on a floor robot might do and then try the buttons out. They will spend time linking an outcome to a button press. Learners will consider the direction command buttons, as well as the 'clear memory' and 'run program' buttons.	To explain what a given command will do ● I can predict the outcome of a command on a device ● I can match a command to an outcome ● I can run a command on a device
2 Directions	Learners will think about the language used to give directions and how precise it needs to be. They will also work with a partner to give and follow instructions. These real-world activities should, at suitable points during this lesson, be related to the floor robot introduced in Lesson 1.	To act out a given word ● I can follow an instruction ● I can recall words that can be acted out ● I can give directions
3 Forwards and backwards	Learners will focus on programming the floor robot to move forwards and backwards. They will see that the robot moves forwards and backwards a fixed distance. This highlights the idea that robots follow a clear, fixed command in a precise and repeatable way. Learners will think about starting the robot from the same place each time. Using the same starting position with fixed commands will allow learners to predict what a program will do. **Note:** This lesson focuses specifically on forward and backward movement only. This is to ensure that learners are developing a depth of knowledge in the concepts surrounding programming, as well as developing their ability to make the robot move. The success criteria for this lesson highlight this and ensure that the learners' knowledge is built in a suitably paced way.	To combine 'forwards' and 'backwards' commands to make a sequence ● I can compare forward and backward movements ● I can start a sequence from the same place ● I can predict the outcome of a sequence involving 'forwards' and 'backwards' commands
4 Four directions	Learners will use 'left turn' and 'right turn' commands along with 'forwards' and 'backwards' commands. Doing this will allow learners to develop slightly more complex programs. Learners will create their programs in this lesson through trial	To combine four direction commands to make sequences ● I can compare left and right turns

	and error, before moving on to planning out their programs in Lesson 5. In Activity 3, learners will predict where given programs will move the robot to. Learners will make their predictions by looking at the commands and matching the program steps to movements.	• I can experiment with 'turn' and 'move' commands to move a robot • I can predict the outcome of a sequence involving up to four commands
5 Getting there	Learners will decide what their program will do. They will then create their program and test it on the robot. Where needed, learners will also debug their program.	To plan a simple program • I can explain what my program should do • I can choose the order of commands in a sequence • I can debug my program
6 Routes	Learners will be encouraged to plan routes around a mat before they start to write programs for those routes. The activities in this lesson also introduce the concept of there being more than one way to solve a problem. This concept is valid for a lot of programming activities: the same outcome can be achieved through a number of different approaches, and there is not necessarily a 'right' approach. The lesson also introduces the idea of program design, where learners need to plan what they want their program to achieve before they start programming.	To find more than one solution to a problem • I can identify several possible solutions • I can plan two programs • I can use two different programs to get to the same place

Subject knowledge and CPD opportunities

This unit focuses on developing learners' understanding of computer programming. It highlights that algorithms are a set of clear, precise, and ordered instructions, and that a computer program is the implementation of an algorithm on a digital device. The unit also introduces reading 'code' to predict what a program will do. Learners will engage in aspects of program design, including outlining the project task and creating algorithms.

When programming, there are four levels that can help describe a project, known as 'levels of abstraction'. Research suggests that this structure can support learners in understanding how to create a program and how it works:

- Task — what is needed
- Design — what it should do
- Code — how it is done
- Running the code — what it does

Spending time at the 'task' and 'design' levels before engaging in writing code aids learners in assessing the achievability of their programs and reduces the cognitive load for learners during programming. Learners will move between the different levels throughout the unit, and this is highlighted within each lesson plan.

Continual Professional Development
Enhance your subject knowledge to teach this unit through the following free CPD:

- Getting started in Year 1 – short course
- Physical computing kits – KS1 BeeBots
- Introduction to primary computing remote or face to face

Teach primary computing certificate
To further enhance your subject knowledge, enrol on the teach primary computing certificate. This will support you to develop your knowledge and skills in primary computing and gain the confidence to teach great lessons, all whilst earning a nationally recognised certificate!

Progression

As this is a Year 1 unit, no prior knowledge is assumed.

This unit progresses learners' knowledge and understanding of giving and following instructions. It moves from giving instructions to each other to giving instructions to a robot by programming it.

Common misconceptions

A common misconception when pupils first use floor robots, or with any early programming, is the idea that if the Bee-bot does not reach it's intended destination that the Bee-Bot 'didn't do what they asked it to'. This is important to tackle early, to ensure that pupils understand that floor robots can only do what we tell them to do. If the floor robot doesn't behave as we expect, the problem is with the program we put onto it, not the robot not behaving. Whilst you may not want to introduce the vocabulary of debugging at this stage, the understanding that computers only follow the instructions given to them, so if an outcome isn't as expected it is down to the program not the computer, is an essential first step to understanding the need to debug.

Curriculum links

Computing

- understand what algorithms are; how they are implemented as programs on digital devices; and that programs execute by following precise and unambiguous instructions
- create and debug simple programs
- use logical reasoning to predict the behaviour of simple programs
- recognise common uses of information technology beyond school

Maths

Measure

- sequence events in chronological order using language [for example, before and after, next, first, today, yesterday, tomorrow, morning, afternoon and evening]

Geometry - position and direction

- describe position, direction and movement, including whole, half, quarter and three-quarter turns

Assessment

Formative assessment

Assessment opportunities are detailed in each lesson plan. The learning objective and success criteria are introduced in the slide deck at the beginning of each lesson and then reviewed at the end. Learners are invited to assess how well they feel they have met the learning objective using thumbs up, thumbs sideways, or thumbs down.

Summative assessment

Please see the assessment rubric document for this unit. The rubric can be used to assess learning and highlights whether the pupil is approaching (emerging), achieving (expected), or exceeding the expectations in this unit.

Resources are updated regularly — the latest version is available at: ncce.io/tcc.

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