

Edbot Basics

Teacher's Guide



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Introduction

This unit is suitable for students in KS2 and KS3 and covers the following criteria:

- design, write and debug programs that accomplish specific goals, including controlling or simulating physical systems
- solve problems by decomposing them into smaller parts
- use sequence, selection and repetition in programs; work with variables and various forms of input and output
- use logical reasoning to explain how some simple algorithms work and to detect and correct errors in algorithms and programs

Number of lessons

Recommend 6 x 1 hour teaching lessons, although this will work with slightly shorter or longer lessons.

The timings shown are colour coded to help you split up the lesson timings to fit your length of lesson.

- Pink** Short activities (under 5 minutes each)
- Yellow** Medium length activities (between 6 and 12 minutes long)
- Blue** Longer activities (over 12 minutes long)

Suitability

This unit is suitable for mixed ability classes.

Differentiation

Lessons are differentiated by outcome and this is reflected in the success criteria and part of each lesson involves the students working independently, freeing up the teacher to offer more one-to-one help to the students who need it. There are also instructions in the lesson plans on how to adapt the lesson for lower or higher ability students.

Preparation needed by the teacher

The teacher needs to make sure that they are familiar with the contents of each lesson and the activities and questions involved which will help them with assisting the students in the lesson.

Each student should be issued with a mark sheet at the beginning of the unit. Some lessons use videos to teach the students the skills they need; this will require the teacher to make sure that they have speakers attached and switched on.

The Edbot Software should be installed on all the PCs and it is a good idea to have the students log in with their individual user names if they have them. This makes it easier to find their PC in the Edbot Software to give them control of the Edbot. You also need to ensure the Edbot Software is configured correctly on the teacher's PC with the Edbot connected via Bluetooth.

Make sure the Edbot's batteries are fully charged and installed correctly.

Before the first lesson you will need to convert the Scratch projects in the **Student Files** and **Teacher Files** folders so they reference the particular name you've given to your Edbot. Use the Edbot Software to do this. You'll find the project converter in the Scratch menu. Copy the converted student files into a shared area that the students will be able to access.

Assessing without Levels

“As part of our reforms to the national curriculum, the current system of ‘levels’ used to report children’s attainment and progress will be removed. It will not be replaced.

We believe this system is complicated and difficult to understand, especially for parents. It also encourages teachers to focus on a pupil’s current level, rather than consider more broadly what the pupil can actually do. Prescribing a single detailed approach to assessment does not fit with the curriculum freedoms we are giving schools.”¹

With this in mind, we have developed a three-tier system which can easily be adapted to any system your school has implemented. We have referred to these bands as

- Foundation Essentials
- Mainstream Learners
- Extended Experts

Assessing Progress

Each student should be given a mark sheet on which they will need to write their name, so that they can get the same sheet back each lesson and could be kept in a work folder which they can refer to every lesson.

The assessment sheet is based on “A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom’s Taxonomy of Educational Objectives”² and avoids use of the old national curriculum levels altogether. This means that the same unit can be used in years 3, 4, 5, 6, 7, 8 or 9 and the students can still show they have made progress.

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Name:		Class:	
Assessment Objective	Foundation Essentials	Mainstream Learners	Extended Experts
A.O.1 Movement	<input type="checkbox"/> I can make Edbot move by controlling individual servos or running a pre-installed motion	<input type="checkbox"/> I can control the servos and run a motion to make Edbot move	<input type="checkbox"/> I can explain why robots are used rather than humans in some situations
A.O.2 Loops	<input type="checkbox"/> I can use forever loops in my code <input type="checkbox"/> I can use repeat loops in my code	<input type="checkbox"/> I can use the repeat until loop in my program <input type="checkbox"/> I can explain what is meant by the term “nested loop”	<input type="checkbox"/> I can plan and create a complex program using a variety of loops and nested loops successfully
A.O.3 If Blocks	<input type="checkbox"/> I can use if blocks and if...then...else blocks <input type="checkbox"/> I can use operators including =, <, > and mathematical operations correctly in my programs	<input type="checkbox"/> I can join strings together to make more complex outputs <input type="checkbox"/> I can create a simple maths quiz <input type="checkbox"/> I can create a number guessing game	<input type="checkbox"/> I can alter my programs to make improvements
A.O.4 Lights	<input type="checkbox"/> I can create a light sequence using loops	<input type="checkbox"/> I can add script to sprites to control the colour of the lights on Edbot	<input type="checkbox"/> I can use the join block and random numbers to control the lights on Edbot
A.O.5 Sensor	<input type="checkbox"/> I can use a forever block, if block and the distance sensor to make Edbot react if something is close by	<input type="checkbox"/> I can write a program to help Edbot navigate as it moves around the classroom automatically	<input type="checkbox"/> I can create a program that uses sprites and the distance sensor to control how Edbot moves around the classroom
A.O.6 Football	<input type="checkbox"/> I can plan the actions needed to help Edbot play football	<input type="checkbox"/> I can create a program which will allow Edbot to play football	<input type="checkbox"/> I can amend and update my program as needed

The assessment should be completed at the end of every lesson by the students as a form of self-assessment and the last slide in each presentation tells the students the skills that they have covered. The students tick the box next to the objective if they feel they have fully met that criteria. The teacher can then use this as a basis to help them assess the students’ ability along with class observations, questioning students and viewing the students’ work.

¹ Taken from www.education.gov.uk/schools/teachingandlearning/curriculum/nationalcurriculum2014/a00225864/assessing-without-levels downloaded on 5th March 2014

² Anderson, L.W. (Ed.), Krathwohl, D.R. (Ed.), Airasian, P.W., Cruikshank, K.A., Mayer, R.E., Pintrich, P.R., Raths, J., & Wittrock, M.C. (2001). A taxonomy for learning, teaching, and assessing: A revision of Bloom’s Taxonomy of Educational Objectives (Complete edition). New York: Longman.

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Lesson 1 – Motors and motions

Lesson objective:	Understand how to write simple commands to control a robot.	
All will be able to: Make Edbot move by controlling individual servos or running a pre-installed motion.	Most will be able to: Control the servos and run a motion to make Edbot move.	Some will be able to: Explain why robots are used rather than humans in some situations.

Differentiation

Low Ability: You may need to give them help on how to create simple code. Try to ask questions rather than tell them which block to add. This will help them start to think about what they want their program to do.	High Ability: If you see a particularly good or intricate program, ask them to talk through what they have done with the rest of the class. Ask them how they can add to their program to improve it further. Encourage them to think about how robots may be used in real-world situations.
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Starter

Time	Description	Resources
Medium Activity	Before the lesson, display the starter on the board so that the students can get started as soon as they enter the classroom. Give them time to talk about the questions together as a pair and then ask random pairs for their answers. Introduce the class to “the Big picture” on slide 3 to explain what the unit is about.	EDBOTBasics_ Lesson1.pptx Slides 2 – 3 EDBOTBasics_ Answers.pdf

Main Activities

Time	Description	Resources
Short Activity	Explain the objectives to the class.	Slide 4
Long Activity	Go through the slides watching the videos and asking the class the questions when prompted.	Slides 5 - 14
Medium Activity	They have a go at creating a program. They need to open the EDBOTBlank.sb2 project first as this has the blocks of code they need to control Edbot and then save that with the suggested name. This way they are not overwriting the blank file as they will need to use this again later. When they raise their hand, select their computer from the dropdown list in the Edbot Software (see user manual for instructions on how to do this) which gives them control of the Edbot.	EDBOTBlank.sb2 Slide15
Long Activity	Explain what motions are and go through the slides asking the questions when prompted. Demonstrate the motions using the sample project motions.sb2 and run it so they can see some of the motions Edbot is capable of. Your students should open the L1_Motions.sb2 project and have a go at creating a program with motions. When they put their hand up, connect to their computer using the Edbot Software and allow them to run their code.	L1_Motions.sb2 Slides 16 – 19 motions.sb2

Plenary

Time	Description	Resources
Medium Activity	Go through the questions on the slide with the whole class. This will help them recap what they have learnt in the lesson.	Slide 20

Self-Assessment

Time	Description	Resources
Medium Activity	Give out the mark sheet EDBOTBasics_MarkSheet.pdf and make sure your students write their name on it. They read through the highlighted objectives and if they feel they have met the criteria fully they need to tick the box. If they do not feel they have met the objective they should not tick the box.	EDBOTBasics_ MarkSheet.pdf Slide 21

Edbot Basics

Lesson 2 – Going Loopy

Lesson objective:	Use loops to create repeated code in your programs.	
All will be able to: Use a “forever” and a “repeat” loop in your code.	Most will be able to: Use the “repeat until” code in your programs and understand what is meant by the term “nested loop”.	Some will be able to: Plan and create a complex program using a variety of loops and nested loops.

Differentiation

Low Ability: Make sure they are given the chance to contribute (especially to the group activity) by asking them directly otherwise they may get overshadowed. Ask them questions to help them get to the correct answer if they are stuck.	High Ability: Use nested loops in their program and talk through the logic of their programs with you. If they feel confident enough you could ask them to help those less able but make sure they are using questions to help the other students rather than simply telling them what to do.
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Starter

Time	Description	Resources
Medium Activity	Watch the video with the whole class, it will go through the motions twice that they need to replicate. They open L2_Starter.sb2 and try to create a program so that Edbot will move in the same way as in the video. If they want to watch the video again then let them. Once a group think they have it, connect Edbot to their program and see if it works. If it does then ask them to explain the code they have otherwise let somebody else have a go until they have the correct answer.	EDBOTBasics_ Lesson2.pptx Slide 2 L2_Starter.sb2 EDBOTBasics_ Answers.pdf

Main Activities

Time	Description	Resources
Short Activity	Explain the objectives to the class.	Slide 3
Medium Activity	Explain what loops are and then they open L2_Loops.sb2 and try to create a program as described. Once they have the answer, ask them to change it from a repeat loop to a forever loop. Ask them to adapt the program to that shown on slide 6. Ask them what they think the program does and allow them to try it out.	Slides 4 – 6 L2_Loops.sb2
Long Activity	Explain what a nested loop is (a loop inside another loop). Allow them to try out the challenge on slide 10. Only show the answer if they get stuck or somebody manages to get it working. Allow them time to experiment with creating programs that contain loops and nested loops. When they are ready to test it out they should raise their hand. Ask them to explain what they want the program to do and then connect to their computer using the Edbot Software and run it to see if they are right.	Slides 7 - 11

Plenary

Time	Description	Resources
Medium Activity	The whole class should work out how to create a program that will allow Edbot to walk around the legs of a chair. They should consider loops and nested loops to allow them to do this. Make sure you always put Edbot back in exactly the same position to start with (you may want to mark this with a bit of sticky tape on the floor) before it runs each time. If the program doesn't work, ask the class to solve it and work together to amend the program.	Slide 12

Self-Assessment

Time	Description	Resources
Short Activity	Give out the mark sheet from the previous lesson. They read through the highlighted objectives and if they feel they have met the criteria fully they need to tick the box. If they do not feel they have met the objective they should not tick the box.	EDBOTBasics_ MarkSheet.pdf Slide 13

Edbot Basics

Lesson 3 – Operators and if blocks

Lesson objective:	Use if blocks which allow multiple possible routes through a program.	
All will be able to: Use if blocks and if...then...else blocks. Use operators including =, <, > and mathematical operations correctly in your programs.	Most will be able to: Join strings together to make more complex outputs. Create a simple maths quiz. Create a number guessing game.	Some will be able to: Alter your programs to make improvements.

Differentiation

Low Ability: For the number guessing game you may want to give them a partially completed example to work from rather than trying to do the whole thing from scratch.	High Ability: They should attempt the two extension activities as outlined on slide 14.
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Starter

Time	Description	Resources
Medium Activity	Ask the class to explain what the code will do. They open L3_Starter.sb2 and create the code to test it out.	EDBOTBasics_Lesson3.pptx Slide 2 L3_Starter.sb2 EDBOTBasics_Answers.pdf

Main Activities

Time	Description	Resources
Short Activity	Explain the objectives to the class.	Slide 3
Long Activity	Ask them what the code will do on slide 4. Explain how if blocks work using the flow diagram on slide 5. Watch the video on slide 6 and then go through the questions on slide 7 with the whole class to recap what they have learnt. They open EDBOTBlank.sb2 and save it as MyQuiz.sb2 and create their own quiz. They should be as imaginative as they want with the questions and allow them to test it out. Open the sample project multiply.sb2 and talk through the code with your students before running it to see it working.	Slides 4 – 8 EDBOTBlank.sb2 multiply.sb2
Long Activity	Go through the slides to explain how to use the join block with variables. Watch the video on slide 12 and then go through the questions on slide 13 with the whole class to recap what they have learnt. They need to create a number guessing game following the instructions and example given on slide 14. Extension Activity: If they create a successful number guessing game ask them to improve it by completing the two additional challenges shown on slide 14.	Slides 9 – 14 EDBOTBlank.sb2

Plenary

Time	Description	Resources
Short Activity	Go through the questions on slide 15 to recap what they have learnt in the lesson.	Slide 15

Self-Assessment

Time	Description	Resources
Short Activity	Give out the mark sheet from the previous lesson. They read through the highlighted objectives and if they feel they have met the criteria fully they need to tick the box. If they do not feel they have met the objective they should not tick the box.	EDBOTBasics_MarkSheet.pdf Slide 16

Edbot Basics

Lesson 4 – Light show

Lesson objective:	Control the lights using loops and variables.	
All will be able to: Create a light sequence using loops.	Most will be able to: Add script to sprites to control the colour of the lights on Edbot.	Some will be able to: Use the join block and random numbers to control the lights on Edbot.

Differentiation

Low Ability: It may help lower ability students to plan out the light sequence they want to create (use initials for each colour to write it out). Then look for bits they would like to repeat and get them to create it from the plan.	High Ability: Ask them to add interaction to the sequence; for instance if the user presses the space bar can they make the sequence run in the reverse order?
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Starter

Time	Description	Resources
Medium Activity	They open L4 Starter.sb2 and work in pairs to work out how to complete the program so that Edbot lights up in the traffic light sequence (red, red and yellow, green, yellow...). They should use the wait function between each sequence and make sure they are including a loop and that red is only shown once in the sequence. Once they think they have it they should raise their hand and you will need to connect the Edbot Software to their computer to allow them to try it. The correct answer is shown on slide 3.	EDBOTBasics_Lesson4.pptx Slides 2 – 3 L4_Starter.sb2 EDBOTBasics_Answers.pdf

Main Activities

Time	Description	Resources
Short Activity	Explain the objectives to the class.	Slide 4
Long Activity	Watch the video and then go through the questions on slide 6 to recap what they have just learnt. They should open the L4_lights.sb2 project and complete the program to control the lights. Allow them to test it out when they think they have completed it.	Slides 5 – 7 L4_lights.sb2
Long Activity	Go through the questions on slide 8 and then ask them to create a similar program. They need to open EDBOTBlank.sb2 and save it as Sequence.sb2 . Once they think they have finished, ask them to explain what they expect the program to do before they test it out to see if it works in that way.	Slide 8 EDBOTBlank.sb2
Medium Activity	Go through the slides asking the students questions and allowing them to test out the code as specified on the slides.	Slides 9 - 11

Plenary

Time	Description	Resources
Medium Activity	They should create a program which will make Edbot light up in a random sequence. The correct answer is displayed on slide 13	Slides 12 - 13

Self-Assessment

Time	Description	Resources
Short Activity	Give out the mark sheet from the previous lesson. They read through the highlighted objectives and if they feel they have met the criteria fully they need to tick the box. If they do not feel they have met the objective they should not tick the box.	EDBOTBasics_MarkSheet.pdf Slide 14

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Lesson 5 – Using the sensor

Lesson objective:	Use the distance sensor attached to Edbot.	
All will be able to: Use a forever block, if block and the distance sensor to make Edbot react if something is close by.	Most will be able to: Write a program to help Edbot navigate as it moves around the classroom automatically.	Some will be able to: Create a program that uses sprites and the distance sensor to control how Edbot moves around the classroom.

Differentiation

Low Ability: Make sure they plan out their programs. They can do this with flow diagrams, writing out each step or writing a bullet list of the code they need, whatever they feel comfortable with. They may need help in finding the code they need and remind them to look at the colours in the examples which should help them.	High Ability: Add a celebration so that if a key is pressed Edbot will do a celebration. See if they can write loops to stop having to tell Edbot to move forward each time. These loops can be attached to a keyboard shortcut on the stage rather than added to the sprites.
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Starter

Time	Description	Resources
Short Activity	Ask the class what they think the program will do. Encourage them to explain each line of the code.	EDBOTBasics_ Lesson5.pptx Slide 2 EDBOTBasics_ Answers.pdf

Main Activities

Time	Description	Resources
Short Activity	Explain the objectives to the class.	Slide 3
Long Activity	Open the sample project sense.sb2 . Talk through the code with your students and then run it to allow the students to see the sensor working. Explain to the class about the sensor. Explain the program using the slides. Ask the students to open EDBOTBlank.sb2 and save it as Navigate.sb2 . They need to write a program that will make Edbot walk around the room avoiding the obstacles. When they think they have written the correct program ask them to talk you through their program before they test it out.	Slides 4 – 6 EDBOTBlank.sb2 sense.sb2
Short Activity	Go through the slides explaining the problem with the first example and how to get around that problem.	Slides 7 - 9

Plenary

Time	Description	Resources
Long Activity	Ask your students to open the L5_Direct.sb2 project and add code to the individual sprites to control how Edbot moves around. Once you have the programs working set out a route around the room and ask people to direct Edbot using their programs. You will need to nominate a team and then connect Edbot to that team's computer so they can start the route. They then nominate a different team to connect their computer to control Edbot for the next section of the route and so on. Test Edbot's sensor occasionally by putting your hand in front of the sensor to see if it refuses to move forwards.	Slide 10 L5_Direct.sb2

Self-Assessment

Time	Description	Resources
Short Activity	Give out the mark sheet from the previous lesson. They read through the highlighted objectives and if they feel they have met the criteria fully they need to tick the box. If they do not feel they have met the objective they should not tick the box.	EDBOTBasics_ MarkSheet.pdf Slide 11

Edbot Basics

Lesson 6 – Let’s play football!

Lesson objective:	Control Edbot in “real-time” by creating a program allowing keyboard control.	
All will be able to: Plan the actions needed to help Edbot play football.	Most will be able to: Create a program which will allow Edbot to play football.	Some will be able to: Amend and update your program as needed.

Differentiation

Low Ability: Ask leading questions to encourage students to think for themselves rather than simply telling them the answer.	High Ability: Challenge them to create a celebratory light show for when Edbot scores a goal.
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Starter

Time	Description	Resources
Medium Activity	The students need to open <i>EDBOTBlank.sb2</i> and save it as <i>Keyboard.sb2</i> . They should create the program as shown.	EDBOTBasics_Lesson6.pptx Slide 2 EDBOTBlank.sb2 EDBOTBasics_Answers.pdf

Main Activities

Time	Description	Resources
Short Activity	Explain the objectives to the class.	Slide 3
Medium Activity	Go through the slides and ask the students to work in pairs to plan the motions (they can look at a blank Scratch project to help them if they are unsure of the names) and then plan the keyboard shortcuts they want to use.	Slides 4 - 6
Medium Activity	They use the project <i>L6_Football.sb2</i> to create the programs they want to use. Make sure they include a script to allow Edbot to get up in case it falls over. Allow them time to test that their motions work correctly. Demonstrate a completed project using the <i>keymap.sb2</i> sample project and talk through the code with your students.	Slide 7 <i>L6_Football.sb2</i> <i>keymap.sb2</i>

Plenary

Time	Description	Resources
Long Activity	If you have more than one Edbot then you can play them against each other. However, if you have a single Edbot you can still play football by asking them to control a ball to score a goal. Any small ball will do but please note a ping-pong ball is very light and will travel a long way when kicked, making it harder to control. As they play they may want to adapt their code and they should be allowed to do this if necessary.	A small ball to act as a football. Test this out before the lesson to make sure Edbot can kick it and it will not travel too far.

Self-Assessment

Time	Description	Resources
Medium Activity	Give out the mark sheet from the previous lessons. They read through all the objectives from the entire unit and if they feel they have met the criteria fully they need to tick the box. If they do not feel they have met the objective they should not tick the box.	EDBOTBasics_MarkSheet.pdf Slide 8