

Introduction

TARGET GROUP

These activities will help teachers to inspire their students to think about how important computer programming is in our everyday lives. The students will gain experience in programming through a mixture of direct teaching, experimentation and exploration, and tutorials from the LEGO® MINDSTORMS® Education EV3 Software. This scheme of work also provides example programming solutions. The material is aimed at Key Stage 3, but can be easily adapted for Key Stage 4. While this material has primarily been written to address the computing curriculum, there are ample cross-curricular opportunities that will have an impact on other subject areas, most notably science, mathematics and design technology.

The lesson plans in this scheme of work will greatly reduce planning time, and the experience gained will help teachers to produce further plans as their experience grows.

At the end of each activity there are full page examples of the pictures and programs that you will find in the lesson plans. These can be used as handouts.

Enjoy!

ACTIVITY OVERVIEW - LINKS TO THE NATIONAL CURRICULUM

ACTIVITY	TASK	NATIONAL CURRICULUM REQUIREMENTS / LEGO MINDSTORMS EDUCATION PROGRESSION	EV3 SOFTWARE BLOCKS COVERED
1	<ul style="list-style-type: none"> – Introduction to Computing – EV3 hardware and software – Simple driving and turning 	<ul style="list-style-type: none"> – Use two or more programming languages, at least one of which is textual, to solve a variety of computational problems 	<ul style="list-style-type: none"> – Move Tank – Wait – Ultrasonic Sensor – Sound
2	<ul style="list-style-type: none"> – Text-based versus visual programming – Students write text-based programs based on Activity 1 	<ul style="list-style-type: none"> – Use two or more programming languages, at least one of which is textual, to solve a variety of computational problems 	<ul style="list-style-type: none"> – Move Tank – Wait – Ultrasonic Sensor – Sound
3	<ul style="list-style-type: none"> – Using the Display and Brick Status Light Blocks – Warning symbols on cars 	<ul style="list-style-type: none"> – Understand that algorithms are capable of carrying out a series of instructions in order – Use the Move Steering Block to make a wheeled robot travel in a straight line. – Use the Wait Block in relation to Touch Sensor(s) – Utilise the Brick Status Light and display functions – Extend computational thinking through the creation of more complex algorithms 	<ul style="list-style-type: none"> – Steering – Wait – Touch Sensor



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4	<ul style="list-style-type: none"> – Colour Sensor – Ambient light settings – Automatic headlamps 	<ul style="list-style-type: none"> – Understand several key algorithms that reflect computational thinking – Understand simple Boolean logic (such as AND, OR and NOT) and some of its uses in circuits and programming 	<ul style="list-style-type: none"> – Wait – Colour Sensor – Display – Time – Loop – Touch Sensor – Loop Interrupt
5	<ul style="list-style-type: none"> – Line following – Automated car 	<ul style="list-style-type: none"> – Understand that algorithms are capable of carrying out a series of instructions in order – Extend understanding of Boolean logic and its uses – Use the Wait Block in relation to the Colour Sensor – Understand that the Colour Sensor has several functions and can measure a range of parameters – Extend the use of the Colour Sensor to recognise LEGO system colours and reflected light intensity – Extend understanding of the Loop Block – Understand the concept of a switch and how to use it for ‘true’ and ‘false’ operations 	<ul style="list-style-type: none"> – Wait – Move Steering – Colour Sensor – Loop – Switch – Loop Interrupt
6	<ul style="list-style-type: none"> – Ultrasonic Sensor – Object detection tool – Car reversing sensors 	<ul style="list-style-type: none"> – Understand that algorithms are capable of carrying out a series of instructions in order – Extend understanding of Boolean logic and its uses – Use the Wait Block in relation to the Colour Sensor – Understand that the Ultrasonic Sensor works by ‘bouncing’ waves off objects and that it can be programmed to respond to distance – Program the wheeled robot to reverse, emit sound based on distance from an object and stop at a given distance from that object – Extend understanding of the Loop Block – Understand the concept of a switch and how to use it for ‘true’ and ‘false’ commands – Understand the Maths Block and its functions – Understand that readings can be taken from one block and sent to another through the use of Data Wires 	<ul style="list-style-type: none"> – Move Steering – Wait – Ultrasonic Sensor – Loop – Math – Sound

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7	– Keyless starting of a car	<ul style="list-style-type: none"> – Understand several key algorithms that reflect computational thinking – Understand simple Boolean logic (such as AND, OR and NOT) and some of its uses in circuits and programming – Use the Logic Block in conjunction with the Switch Block – Use several sensors in combination to activate a program on the EV3 Brick 	<ul style="list-style-type: none"> – Wait – Touch Sensor – Display – Wait – Time – Ultrasonic Sensor – Brick Buttons – Logic – Switch – Loop – Move Steering
8	– Design cruise control	<ul style="list-style-type: none"> – Understand several key algorithms that reflect computational thinking – Use the Variable Block to store information – Develop multi-level programs – Create My Blocks 	<ul style="list-style-type: none"> – Wait – Touch Sensor – Loop – Switch – Variable – Math – Move Steering – My Blocks
9	– Arrays: how do they work?	<ul style="list-style-type: none"> – Make appropriate use of data structures such as lists, tables and arrays – Understand simple Boolean logic (such as AND, OR and NOT) and some of its uses in circuits and programming – Use the brick buttons to control the movement of the wheeled robot – Use the Variable Block to store information – Use the Array Operations Block 	<ul style="list-style-type: none"> – Variable – Wait – Brick Buttons – Loop – Sound – Array Operations – Time – Move Steering – My Blocks
FINAL PROJECT			
10	– Designing your driverless, automated, wheeled robot	– Design, use and evaluate computational abstractions that model the state and behaviour of real-world problems and physical systems	– Any programming blocks can be used from previous weeks
11	– Build and program a driverless car	– Design, use and evaluate computational abstractions that model the state and behaviour of real-world problems and physical systems	– Any programming blocks can be used from previous weeks
12	– Evaluate the design, make changes and conclude the design effectiveness	– Design, use and evaluate computational abstractions that model the state and behaviour of real-world problems and physical systems	– Any programming blocks can be used from previous weeks