

MISSION 3 (Beginner): On The Move!

Mission Aim:

Learn how to program the SPIKE Prime Colour Sensor

Success Criteria:

- Program hardware (motors) to move, turn and deliver with accuracy and precision
- Program the Colour Sensor to control the EV
- Through experimentation, be able to identify and remove errors (debugging)

Key words and definitions:

Colour Sensor: The sensor can detect colour, reflectivity or ambient light. The sensor can also be used as a light output.

Debugging: Testing the outcome of programs and correcting any errors

'Green' infrastructure: Physical structures/systems that benefit the environment

SAF: Sustainable Aviation Fuel

Mission 3 Summary:

- Pupils will build on the coding skills they established in Mission 2.
- **Mission 3** will see your pupils learning how to code the Colour Sensor to help develop greater accuracy and precision as their SPIKE Prime EV moves forwards, backwards, turns and moves 'green' infrastructure to different locations on the Mission Mat.

Resources for Mission 3:

Pre-build Models -

Build (or have pupils build) **TWO SPIKE Prime electric vehicles (EVs)** using the Build Guide found in Essential Resources/Build Guides/[EV_BuildGuide.pdf](#).

Build (or have pupils build) 2 solar panels, 2 wind turbines, 2 biomass containers, 2 hydro turbines and 2 storage shelves using the Build Guide found in Essential Resources/Build Guides/[MatElements_BuildGuide.pdf](#).

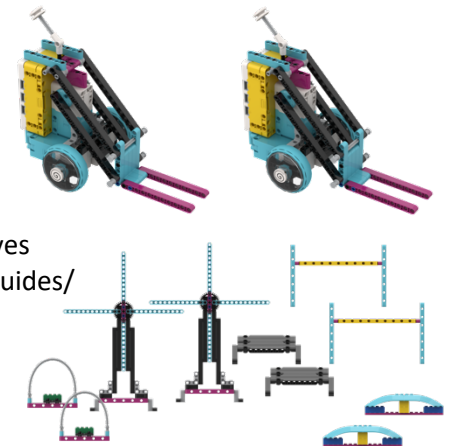
Worksheet -

Pupil worksheet found in Mission 3/[B_M3_Worksheet](#)

Additional Resources –

Mission 3 Presentation - Mission 3/[B_M3_Presentation.pptx](#)

Set up the Mission Mat for Mission 3 using the guide found in Essential Resources/Mission Mat/[MatGuide.pdf](#). This guide will also reference any Mat resources that you need.



Mission 3: FLEXIBLE LEARNING PLAN

ENGAGE:

5-10 mins approx.

- Introduce pupils to the context of Mission 3 by showing [SLIDES 1-2](#) of the Mission 3 Learning Presentation ([B_M3_Presentation.pptx](#))
- Show [SLIDES 3-5](#) to set the scene for Mission 3, outlining how the 3 renewable energy sources (hydro, wind and biomass) generate power
- Show [SLIDE 6](#) and introduce the Mission Aim

SUPPORT AND/OR CHALLENGE:

EXPLAIN:

10 mins approx.

- Show [SLIDE 7](#) and recap on how accurate and precise the EVs were in Mission 2
- Show [SLIDE 8](#) and the SPIKE Prime EV build – identify where the Colour Sensor is located and explain what it can do.
- Show [SLIDE 9](#) and explain how to program the Colour Sensor to create a precise and accurate stop
- Play [SLIDE 10](#) (3 mins) which demonstrates how to code the Colour Sensor to create a precise and accurate stop (or demo this live)

SUPPORT AND/OR CHALLENGE:

Teacher might add a glossary of new terminology to the board to support literacy skills.

Some pupils might benefit from the teacher pausing the [SLIDE 10](#) video to reinforce key learning points.

EXPLORE

35 mins approx.

- Hand out the worksheet to pupils and show [SLIDE 11](#) to give a brief overview of Challenges A-D
- Display [SLIDE 12](#) as pupils use the SPIKE App to code the solutions to the Mission 3 Challenges, taking it in turns to run their code on one of the 2 EVs and debugging as required! Encourage pupils to position the EV at EV BASE (A1) with the Colour Sensor over the intersect in the centre of A1 and facing towards A5 each time they run their code
- When pupils are ready, introduce Challenge E and show [SLIDE 13](#) to recap on the code needed to change the position of the large motor (which lifts and lowers the EV lifter). This will enable pupils to deliver 'green' infrastructure to key locations and it introduces the code required to lift heavier objects.
- Play [SLIDE 14](#) (1 min 32 sec) to demonstrate how to 'hold' the large motor when lifting heavier objects. This will help pupils complete Challenge E.
- Again, display [SLIDE 15](#) as pupils use the SPIKE App to continue to code the solutions to the Mission 3 Challenges.

SUPPORT AND/OR CHALLENGE:

For additional support, display (or print out) [SLIDE 13](#) for pupils to reference when coding.

Some pupils might focus on Challenge A, B and C; helpful top tips are on the worksheet. Some pupils might code the EV to 'push' the objects into position (rather than code the lifter). Teachers might also offer additional support using the programs themselves in [B_M3_CodeSolutions](#).

Pupils could attempt Challenge E and 'Tinkering Time' once they feel confident coding the EV with accuracy and precision.

Some pupils might begin an optional Scratch Challenge activity when waiting to run their code on an EV - the link is shown on [SLIDE 16](#).




EVALUATE AND CELEBRATE:









5 mins *approx.*

- Show **SLIDES 17-18** to review the accuracy/precision and the Mission 3 Aim
- Show **SLIDE 19** to introduce Mission 4 and play **SLIDE 20** (2 mins 54) to introduce RAF Voyager which has been powered by 100% Sustainable Aviation Fuel (SAF)
- Play **SLIDE 21** (1 min 10 sec) to signpost forward to Mission 4
- Show **SLIDE 22** and congratulate pupils on their coding success!
- If you wanted to run additional activities based on the learning from Mission 3, you could allow pupils to undertake **Coding Success: CLUB** and use **SLIDES 23-24** which introduces Activity 2 'Express Delivery!'

SUPPORT AND/OR CHALLENGE:

Some pupils might enjoy extending their learning outside lesson time, by taking part in **Coding Success: CLUB**

Computing/Computer Science Links		
	Key Stage 2 <ul style="list-style-type: none"> Design programs that accomplish specific goals. Debug programs that accomplish specific goals. Use repetition in programs. Control or simulate physical systems. Use logical reasoning to detect and correct errors in programs. Work with various forms of input. Work with various forms of output. 	Key Stage 3 <ul style="list-style-type: none"> Design, use and evaluate computational abstractions that model the state and behaviour of real-world problems and physical systems.
	Second Experience & Outcome (to end of P7) <ul style="list-style-type: none"> TCH 2-14a: I can explain core programming language concepts in appropriate technical language. TCH 2-15a: I can create, develop and evaluate computing solutions in response to a design challenge. 	Third & Fourth Experiences & Outcomes (S1 – S2) <ul style="list-style-type: none"> TCH 3-13b: I am developing my understanding of information and can use an information model to describe particular aspects of a real world system. TCH 3-15a: I can select appropriate development tools to design, build, evaluate and refine computing solutions based on requirements. TCH 4-13a: I can describe in detail the processes used in real world solutions, compare these processes against alternative solutions and justify which is the most appropriate. TCH 4-13b: I can informally compare algorithms for correctness and efficiency. TCH 4-15a: I can select appropriate development tools to design, build, evaluate and refine computing solutions to process and present information whilst making reasoned arguments to justify my decisions.
	Progression Step 3 <ul style="list-style-type: none"> I can use conditional statements to add control and decision-making to algorithms. I can identify repeating patterns and use loops to make my algorithms more concise. I can use sensors and actuators in systems that gather and process data about the systems' environment. <p>I can explain and debug algorithms.</p>	Progression Step 4 <ul style="list-style-type: none"> I can plan and implement test strategies to identify errors in programs. I can apply design principles in order to design a range of efficient user interactions.

Skills Builder – Universal Framework        	<p>During each Mission, you might wish to highlight one or more of the essential skills that pupils build over their lifetime. You might give pupils the opportunity to reflect on how successful they have been in developing these skills.</p> <p>The Skills Builder documentation can be found in Essential Resources/Skills/SkillsBuilder.pdf. This includes further details of how the 'Universal Skills Builder Framework' links to the Coding Success 3 project. Additional details of the Skills Builder Framework and assessment opportunities can be found at www.skillsbuilder.org</p>
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GATSBY FRAMEWORK	<p>The Gatsby Career Benchmarks is a framework of eight guidelines about what makes the best careers provision in schools and colleges. The Gatsby documentation can be found in Essential Resources/Skills/Gatsby.pdf. It provides further details of how the 'Gatsby Framework' links to the Coding Success 3 project.</p>
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