

Spotlighted unit

Details on a specific unit of work at the school.



Digital Technologies case studies project

Level

7-8

Title / theme

Robotics – Mars One Mission

Summary / intention

Human Settlement on Mars is possible today with existing technologies. In this unit, students imagine they are a part of a team that is going to apply to become one of the first people to set foot on Mars. Working through the project life cycle, students will analyse the problem and describe how technology can be used to solve it. They design space suits and algorithms that will help with living on Mars and for us to learn more about the planet. They develop their algorithms by coding a robot rover to carry out missions that would be deemed as required on Mars. Finally, they can demonstrate how they can evaluate their solutions to show how improvements could be made. Rich discussions with their team members will ensure a collaborative application, enabling students to show how they can work together and follow protocols for saving and sharing work online.

Students learn about digital systems and coding by designing and programming robots.

Students are introduced to a Problem Solving Methodology: Analysing, Designing, Developing and Evaluating.

At the end of the unit students present:

Video Application including video diary or movie of their learning missions and testing involved.

A presentation of their new space suit design.

Strands addressed

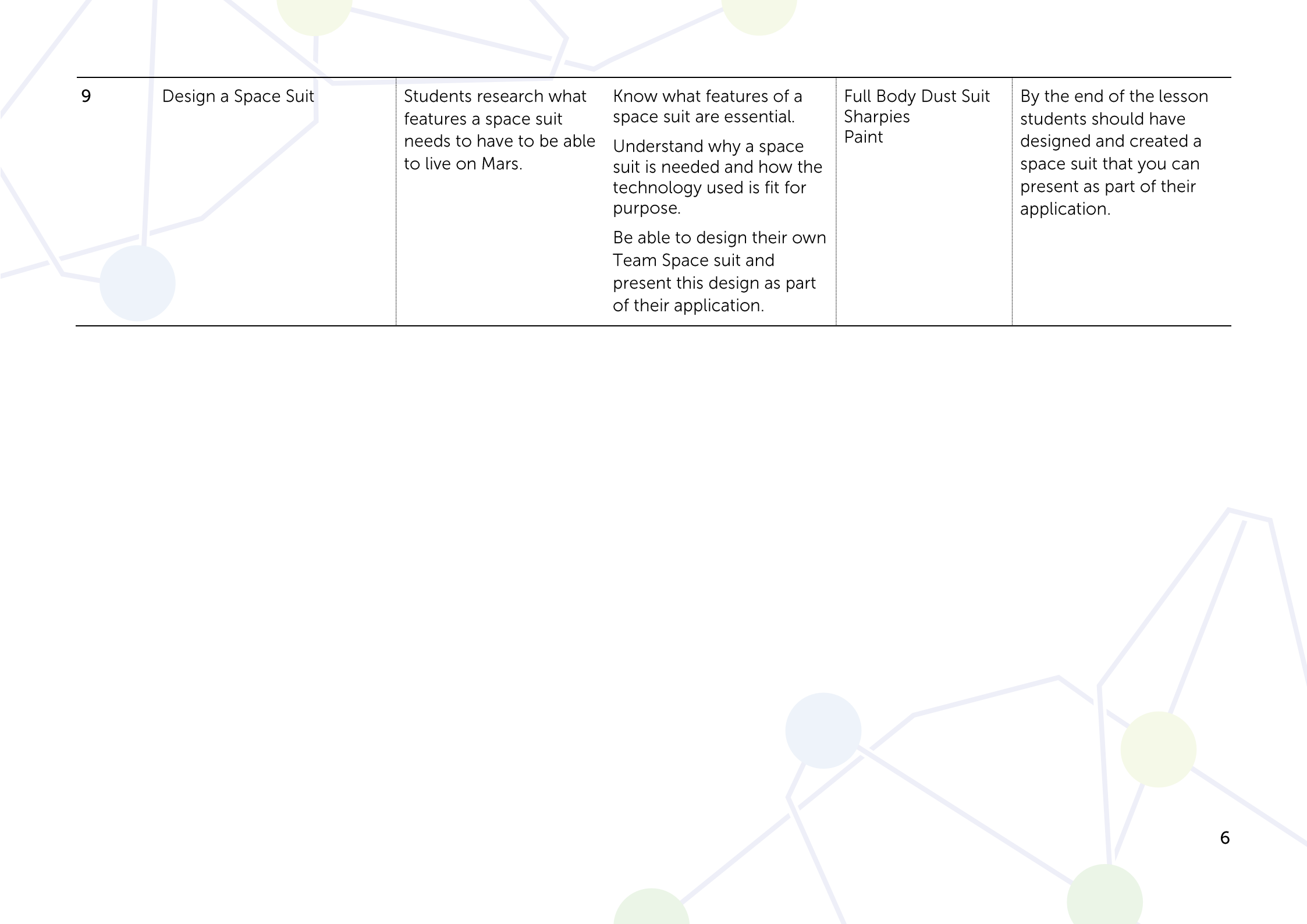
- Digital Systems Data and information Creating digital solutions

Session	Activity summary	Learning intention	Success criteria	Key resources	Assessment statement
1	<p>What is Mars One Mission?</p> <p>Mission Feasibility</p> <ul style="list-style-type: none"> • Permanent Settlement • Use of In-situ Resources • Solar Panels • Existing Technology • International yet apolitical 	<p>Students evaluate information systems and their solutions in terms of meeting needs, innovation, and sustainability.</p> <p>How will technology enable this mission, specifically: Rovers, Space Suits and Communication Systems</p> <p><u>(VCDTCD040)</u></p>	<p>Know what technology can be used to enable the Mars One Mission</p> <p>Capabilities:</p> <ul style="list-style-type: none"> • Intercultural Capability • Personal and Social 	<p>http://www.mars-one.com/about-mars-one</p> <p>Debate: Split the class into 2 groups.</p> <p>One for applying One against applying</p> <p>Give students time to prepare their case</p>	<p>By the end of the lesson students should have built the driving base of the robot, following instructions.</p> <p>They should be able to label each component of the robot.</p> <p>Students should be able to explain to their team what the Mars One Mission is and be able to give a reason for a and against applying to be a part of the mission.</p>
2	<p>Work with existing technologies to help solve problems.</p> <p>Investigate the components of the EV3 Robots.</p> <p>Building the Rover (Driving Base)</p>	<p>Students build the driving base of the EV3 whilst learning about the components that could be added on as required.</p> <p>Specifically:</p> <ul style="list-style-type: none"> • Output: Motors • Input: Sensors 	<p>Know the components of a robot.</p> <p>Understand how an EV3 Mindstorms Robot will be used to demonstrate what a Mars Rover will need to be able to do.</p> <p>Be able to name each component of the EV3 robot and build it to the driving base.</p>	<p>Class set of EV3 Mindstorms.</p> <p>Students need Lego Education software.</p> <p>Instructions on how to build driving base</p>	<p>By the end of the lesson students should share ideas about what problems could be solved on Mars by using components of existing technology.</p>

3	<p>Students are introduced to designing algorithms diagrammatically and in plain English.</p>	<p>(VCDTCD042)</p> <p>Students create flowcharts using digital systems to describe a set of computational instructions after deciding on what actions a Mars Rover would need to undertake when on Mars.</p> <p>Students identify five operations that a robot would need to perform. Examples include:</p> <ul style="list-style-type: none"> • Moving around obstacles to avoid getting damaged or falling into craters. • Picking up rock of a certain colour to preserve for further analysis • Moving and Turning around the planet autonomously • Following a prescribed pathway Grab and releasing certain elements for unpacking equipment on Mars 	<p>Know that algorithms can be described using a flowchart or written in plain English to aid with understanding of the steps needed</p> <p>Understand that this process can help predict errors</p> <p>Be able to express algorithmic instructions by drawing or writing them out in English</p>	<p>Flowchart Shapes in Word</p> <p>Flow charting software</p> <p>Drawing them out on paper</p>	<p>By the end of the lesson each student is to explain the computational instructions that would need to be given to the rover to complete each task.</p>
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4	Introduction to Coding Concepts when programming a robot	<p>Branching involves following a different step based on a yes/no decision</p> <p>Students describe a decision that has more than two options e.g. detecting an object. If object is < 10 cms stop for 2 sec, reverse, turn and move forward again.</p> <p>Iteration: Involves repeating a sequence of steps until a condition is met.</p> <p>Students describe algorithms that repeat one or more steps a fixed number of times</p> <p>For example, does the colour = red. No, then keep moving forward. Yes = then stop</p> <p>Functions: Students can create code that can be defines as a separate program but used when needed withing another program</p>	<p>Know what each coding concept is.</p> <p>Understand where it can be applied in a program.</p> <p>Be able to use each coding concept to make your code more efficient.</p>	Visual Based Coding: Lego Mindstorms Software	By the end of the lesson students should be able to discuss several coding concepts in general.
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5	<p>Extension – Students who are ready for text-based programming. For example, one option is to use a text-based programming language, such as RobotC, that better reflects the dominant style of programming in the computer industry.</p>	<p>Functions: A block of code that performs a specific task and can be called when needed in a program. Students can define and use their own functions to make programs more modular. The functions they develop can produce different return values based on input parameters.</p>	<p>Know what each coding concept is.</p> <p>Understand where it can be applied in a program.</p> <p>Be able to use each coding concept to make your code more efficient.</p>	<p>Text Based Coding: RobotC http://www.robotc.net/</p>	
6-8	<p>Students and plan, code and evaluate for 6 learning missions to include in their application for the Mars One Mission</p> <p>Students evaluate as they complete each mission</p>	<p>Students decide on 6 learning missions they could use to demonstrate their suitability for a place on the Mars One Team.</p> <p>Students can be scaffolded or prompted, below.</p>	<p>Know what missions that a rover would have to do during the Mars One Mission</p> <p>Understand how each mission can be planned for, developed, and tested in order to demonstrate your skills in your application</p> <p>Be able to complete 5 Mars One Missions using the Lego EV3 Mindstorm as a rover.</p>	<p>Lego Mindstorms Software of their choice: visual based coding or text-based coding</p>	<p>At the end of the lesson, students should be successful in coding their robot for a variety of missions that would be relevant for a rover in Mars.</p> <p>Students create a video application of their success or otherwise on their learning missions</p>



9	Design a Space Suit	Students research what features a space suit needs to have to be able to live on Mars.	Know what features of a space suit are essential. Understand why a space suit is needed and how the technology used is fit for purpose. Be able to design their own Team Space suit and present this design as part of their application.	Full Body Dust Suit Sharpies Paint	By the end of the lesson students should have designed and created a space suit that you can present as part of their application.
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