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| Tasmanian Department of Education logo | Raspberry Pi for Desserts |  |

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| **Unit #:** | TDOE-00079362  | **Duration:**  |  | **Date(s)**  | 27-08-2018 to 12-12-2018  |
| * **Team:**scott.prebble@education.tas.go scott.prebble@education.tas.go (Author)
* **Grade(s)** 6, 7, 8
* **Subject(s)** Design and Technologies, Digital Technologies, Science
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| **Unit Focus**  |
| By the end of Year 8, students will have had opportunities to create a range of digital solutions, such as interactive web applications or programmable multimedia assets or simulations of relationships between objects in the real world. They broaden their programming experiences to include general-purpose programming languages. Students plan and manage individual and team projects with some autonomy.  |
| **Prior Learnings/Connection**  |
| Students have been exposed to block coding and working in small teams to design and implement a solution to a problem. They recognise the internet to be a source of help and inspiration and can effectively research a given topic using safe and reliable sources. |

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| **Stage 1: Desired Results - Key Understandings**  |
| **Standard(s)**  | **Transfer**  |
| **Australian Curriculum Achievement Standards v8.3**Design and Technologies: 7-8* Students create designed solutions for each of the prescribed technologies contexts based on an evaluation of needs or opportunities. *ACSA-DAT7-8.4*

Digital Technologies: 7-8* Students plan and manage digital projects to create interactive information. *ACSA-DT7-8.3*
* Students design user experiences and algorithms incorporating branching and iterations, and test, modify and implement digital solutions. *ACSA-DT7-8.5*

**Australian Curriculum Content Descriptors v8.3**Science: 7* Solutions to contemporary issues that are found using science and technology, may impact on other areas of society and may involve ethical considerations *ACSHE120*

**ACARA General Capabilities V.8.0***Evaluate procedures and outcomes** evaluate whether they have accomplished what they set out to achieve *AC.GC.CCT.2.4.3.1*

*Seek solutions and put ideas into action** assess and test options to identify the most effective solution and to put ideas into action *AC.GC.CCT.4.2.3.1*

*Seek solutions and put ideas into action** predict possibilities, and identify and test consequences when seeking solutions and putting ideas into action *AC.GC.CCT.5.2.3.1*
 | **T1** Students will be able to independently use their learning to identify and solve problems through collaboration and teamwork.They will be able to use their learning to create a program using digital code. |
| **Meaning**  |
| **Understanding(s)**  | **Essential Question(s)**  |
| **U1** Students will understand that problems affecting the environment can be addressed through collaborative and imaginative processes. Technology can be used to solve complex problems and perform resource saving operations. | **Q1** How can I use technology to benefit the environment and perform resource-saving tasks.**Q2** How does a Raspberry Pi work?**Q3** How can I write code that will perform a function and provide a desirable outcome? |
| **Acquisition of Knowledge and Skill**  |
| **Knowledge**  | **Skill(s)**  |
| **K1**data s transmitted through wired and wireless networks and how the specifications will affect performance and outcomes. | **S1**Students will be skilled at implementing and modifying programs with user interfaces involving branching and iterations in a general-purpose programming language. They will use problem solving strategies and collaboration skills. |

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| **Stage 2: Assessment Evidence**  |
| **Performance Task(s)**  |
| **Alignment**  | **Code**  | **Assessment Evidence**  |
|   | PT1  | SOLO Assessment Rubric **Due** Nov. 29, 2018 Performance Task https://eduplanet21-production.s3.amazonaws.com/wysiwygData/f114299a-c8bf-471a-aaec-9960999612c2.pngResources

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| RES4  | team management.docx  | Team Management Reflection Rubric  | [Download File](https://eduplanet21-production.s3.amazonaws.com/OrganizationData/None/unit_resources/None/87716831-9ac5-4121-b145-8781a60e4ba4/team-management.docx?AWSAccessKeyId=AKIAI7VPQICHF3ZD5C3A&Expires=1541805129&Signature=PMcno0TYcyHgf%2F%2BWu%2BNshhUNPh4%3D) |  |

Comments |
|   | PT2  | Team Peer Assessment **Due** Dec. 3, 2018 Performance Task https://eduplanet21-production.s3.amazonaws.com/wysiwygData/794cd4e5-5e7c-497f-af01-9402eac6ab83.jpgResources Comments |

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| **Stage 3: Learning Plan**  |
| **Pre-Assessment**  |
| Tuning In ActivityWhat can robots do?How are robots helping to protect humanity?What is the difference between a drone and an autonomous robot?Have students form small groups and present each group with these three questions.Each group discusses the three questions and decide on what their answer will be. Once every group has an answer to each question, number of every student in each group and then have all the number one students form a new group. Then the number two students form a second group and so on until all students are in a new group.Each member of the new group shares the three answers that they previously formulated and then the group decides which answer is best. Different answers can be morphed into a new answer if everyone n the group agrees.Each group appoints a spokesperson and then all answers are shared and discussed as a whole class. |
| **Alignment**  | **Code**  | **Learning Activities**  |
|   | LA1  | The Raspberry Pi Learning Activity ACTIVITY THE INTERNET OF THINGSWhat problems can be solved using a programming board?Australian Curriculum Alignment* Investigating and defining ([ACTDIP027](https://www.australiancurriculum.edu.au/Search/?q=ACTDIP027))

WHAT'S THIS ABOUT?Before a solution can be designed and created it is necessary to find out what is the cause of any existing problem and what will solve it or for a new situation, what is required of a solution. This means students must initially define the problem and decompose into a set of functional requirements that consider the social, technical and usability constraints to their solution.Electronic programming boards can be used by students to create digital solutions for a range of problems. The programming boards typically use a microcontroller which is a small chip (a tiny computer) that sends and receives signals to turn things on and off. The micro-controller is connected to inputs such as buttons or sensors and outputs such as lights or a speaker. These components combined together are referred to as an embedded system. An embedded system is designed to run one program.Examples of programming boards include Arduino (many different types including Lily Pad, Nano or Esplora), BBC Micro-bit, Raspberry Pi and BlueBerry4.LEGO® MINDSTORMS® products such as EV3 incorporate an on-board microcontroller referred to as an intelligent brick.Learning tasks1. Provide students with the opportunity to brainstorm a list of problems that can be solved digitally by creating a solution using resources available in the classroom that incorporate a microcontroller.
2. For the selected problem, students should state two or three features (requirements) that the solution must be able to perform. They also need to consider if there are any special user needs or technical requirements regarding the solution.
3. Discuss the ‘Internet of Things’ and the way in which devices around the home can be controlled via networked devices. Brainstorm solutions to problems that they can design a prototype to meet the need. For example, while away a plant needs to be watered, turning lights on and off to mimic being at home while being on holiday or an alarm system.
4. Students can negotiate their own projects to use embedded systems for example, projects that use Raspberry Pi / Lilypad Arduino, Arduino Nano / BBC:microbit or BlueBerry4 .
5. Provide an overview and walk through of the resources available for example if students have access to the Arduino Lily Pad discuss the input and outputs so that students are aware of its capabilities when designing their solutions. At a later stage they will need guidance as to the syntax used to program the board.
* Introduce or re-introduce the Raspberry Pi and discuss each accessory and its function.

Resources Comments |
|   | LA2  | Designing for the User Learning Activity ACTIVITY DESIGNING FOR THE USERHow do I design my digital solution?Australian Curriculum Alignment* Generating and designing ([ACTDIP028](https://www.australiancurriculum.edu.au/Search/?q=ACTDIP028)/[ACTDIP029](https://www.australiancurriculum.edu.au/Search/?q=ACTDIP029))

WHAT'S THIS ABOUT?Programmable robots or microcontrollers can be incorporated into digital solutions to solve problems of increasing complexity, progressively adding additional functions such as the control of motors, lights, sounds and sensors.At this level, students should be generating design ideas using techniques such as brainstorming, forced analogies, prototyping and SCAMPER (substitute, combine, add something, magnify or minify, put to other use, eliminate), A paper prototype can also be used in the design process to map out plans what’s on screen, the logic behind transitioning between screens and how various elements may work together as a system. The paper prototype can inform algorithm development.Algorithms are generally written as a flowchart or in pseudocode. At this level, students are expected to write their algorithms in structured English.Learning tasks1. It is important that in their design, students consider the ‘user experience’ as well as the writing of instructions to operate the solution. For example, can output be shown in multiple ways such as sound and action or are the controllers of a suitable size to allow accessibility for people with special needs?
2. Provide opportunities for pairs of students to verbally or physically follow the algorithmic instructions of their partner. For example, for a robotic solution, a partner walks the route as stated in the algorithmic diagram or structured English – this allows any design errors to be located early in the problem-solving process.
3. Support and guide students with the design process, planning and project management.

[Digital Technologies Hub - Designing for the User](https://www.digitaltechnologieshub.edu.au/teachers/scope-and-sequence/7-8/creating-digital-solutions/robotics-and-embedded-systems)Resources Comments |
|   | LA3  | Programming a Solution Learning Activity ACTIVITY PROGRAMMING A SOLUTIONHow do I program my solution?Australian Curriculum Alignment* Producing and implementing ([ACTDIP030](https://www.australiancurriculum.edu.au/Search/?q=ACTDIP030))

WHAT'S THIS ABOUT?Student should develop an understanding of computer programming as a collection of smaller programs – functions, that collectively work to solve complex problems.Link to Digital Systems: Many educational robot kits and micro-controllers can be connected together to form a networked environment, with opportunities to explore how data is transmitted to and from devices using wired connection, infrared, wireless connections, and in some cases data transmission methods such as sound, light or touch.At this level, students are required to test and make modifications to their solutions as they are developing it. Testing involves selecting specific functions/features of the solution to check that they operate as planned, for example, did a light go on when a specific button was pushed?Learning tasks1. Working from their designs, students build their robotic device from a commercially available robotic kit or from purpose-selected electronic equipment.
2. Support students to learn the syntax of the particular programming language required to code the programming board.
3. Introduce libraries of code and creation of functions / procedures. For example, Arduino has a list of Example sketches students can use to get started.
4. Students should develop a small testing table at the beginning of this process and carry out these tests. For example, the table could identify three functions that are going to be tested, state what result they expect to see and then the results when the functions were actually tested. If the results did not match, students should make modifications to their solution. They might need assistance in carrying out these modifications.

[Digital Technologies Hub - Activity Programming Solution](https://www.digitaltechnologieshub.edu.au/teachers/scope-and-sequence/7-8/creating-digital-solutions/robotics-and-embedded-systems)Resources Comments |
|   | LA4  | Evaluation Learning Activity ACTIVITY EVALUATEHow well did my solution work?Australian Curriculum Alignment* Evaluating ([ACTDIP031](https://www.australiancurriculum.edu.au/Search/?q=ACTDIP031))

WHAT'S THIS ABOUT?Evaluation differs from testing as it requires a judgement about how well the entire solution meets the functional requirements. This process happens once the solution has been created, whereas testing takes placing during the development of the solution.When evaluating, students may assess their solutions on:* how well they meet user needs
* how innovative their solution is compared to existing solutions
* how sustainable their solution will be for different users, purposes, and technology improvements
* how well they collaborated and managed the project.

Learning tasks1. Organising or attending a culminating event where students showcase their projects is a great way to evaluate the digital solution and celebrate the learning.
2. Some innovative designs that are created by students to solve a problem can be taken to the ‘pitch’ stage of the problem-solving process. Have students create a 60 second video to pitch their solution similar to those featured on Kickstarter projects. They should tell how their solution meets specific requirements.

[Digital Technologies Hub - Evaluate](https://www.digitaltechnologieshub.edu.au/teachers/scope-and-sequence/7-8/creating-digital-solutions/robotics-and-embedded-systems)Resources

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| RES5  | implementation\_schedule.docx  | Unit Implementation Schedule  | [Download File](https://eduplanet21-production.s3.amazonaws.com/OrganizationData/None/unit_resources/None/3ef30b54-172b-43cd-8719-3ab63b036620/implementation_schedule.docx?AWSAccessKeyId=AKIAI7VPQICHF3ZD5C3A&Expires=1541805129&Signature=Bf7cY7ad82MdkGkJW3fswChm%2FVg%3D) |  |

Comments |

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| **Additional Information**  |
| **Resources**  |
| **RES**  | **RES**  | **RES**  |
| RES1  | - [Raspberry Pi Ultrasonic Sensor instructions](https://pimylifeup.com/raspberry-pi-distance-sensor/)[Introduction to Breadboards](https://www.youtube.com/watch?v=6WReFkfrUIk)[Installing a humidity and temperature sensor](http://www.circuitbasics.com/how-to-set-up-the-dht11-humidity-sensor-on-the-raspberry-pi/) |  |
| RES2  | - Ozobots website discusses ways that robots are helping to protect the environment. | <https://blog.ozobot.com/2018/08/28/robots-helping-fight-climate-change/> |
| RES3  | Raspberry Pi Light Sensor setup guide -  | <https://pimylifeup.com/raspberry-pi-light-sensor/> |
| **Comments/Notes**  |
| **scott.prebble@education.tas.go scott.prebble@education.tas.go *(Nov. 8, 2018, 6:12 a.m.)***

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| Date | Task | Outcome | Completed |
| 19\10\201 | Raspberry Pi unit introduced to students | Tuning-in Activity  Introduce the Raspberry Pi  Introduce Collaborative Task Assignment  Teams formed  Team roles allocated and acceptedInitial planning commenced   |  |
| 26\10\2018 | Designing for the User | Small group activity demonstrating the importance of clear and precise instructions  Whole group discussion about what the ‘user experience’ means.Continue support of students with the design process, planning and project management.Resources identified for collection |  |
| 2\11\2018 | Programming a Solution | Begin building and programming autonomous robot. |  |
| 9-28\11\2018 | Programming and building a Solution continues | Program, build and debug solution continued. |  |
| 29\11\2018 | Present solution to class | Share solution with class including challenges and changes. |  |
| 30\11\2018 | Demonstrate solution | Demonstrate the solution for effectiveness and solution |  |
| 6\12\2018 | Post submission peer reflection and evaluation | Student complete peer reflection and evaluation |  |

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