Internal Assessment Resource

Achievement Standards: 91901 and 91904

Standard title: 91901 Apply user experience methodologies to develop a design for a digital technologies outcome (3 credits)

91904 Use complex techniques to develop an electronics outcome (6 credits)

Credits: 9

Resource title: Battery powered water irrigation system

Resource reference: Digital Technologies & Hangarau Matihiko 3.2B_3.5B

Student/Akonga instructions

Introduction/Kupu Arataki

This assessment activity requires you to:

- Develop a refined electronics outcome that enables irrigation control in remote locations, specifically interfaces for environmental sensing, automated timers and manual interrupts.
- Generate and model design ideas using user experience methodologies to address component selection, user interfaces and interfacing of input/output and power supply.

You are going to be assessed on how effectively you apply user experience methodologies to develop a refined design for your electronics outcome and on the skills and knowledge shown in the development of an electronics outcome.

You may work with others to help generate ideas and develop those ideas. However, you will be expected to show your own thinking and evidence of how you discussed and combined ideas together to write and submit your own evidence.

Due Date: September 23rd

Task/Hei Mahi

Follow the steps below:

Apply user experience methodologies

- Select an appropriate situation/location for your battery powered irrigation system, for example: family vegetable garden, school plants, indoor pot-plants, local community garden, farm paddock.
- Explain the purpose of the outcome and the requirements of the end users.
- Investigate relevant user experience methodologies: this could include usability evaluation techniques, user-interface design guidelines. Summarise your findings.
- Generate at least two design ideas using user experience methodologies.
- Select an appropriate design and explain the appropriateness of the design chosen.
- Model and test the chosen design. This means test/check whether your ideas are feasible, check that end users understand how your system will function.
- Effectively use data gained from modelling to improve the design.
  Present your design ideas with annotations that show feedback on your designs and improvements.
- How does your chosen design address each of the following?
  - justify the user experience methodologies used to develop the chosen design
  - justify how the design is suitable for the purpose and end users
  - evaluating how the chosen design makes use of user experience methodologies (e.g. evaluating the ease of use of the interface for the end user)
  - explain relevant implications and evaluate how the chosen design addresses them
  - justify how the chosen design might be further developed.

Develop an Electronics Outcome

- Use appropriate resources and techniques to develop a functional outcome and that addresses relevant implications.
  Take photos of development and clearly annotate/label each interface.
- Construct, test and analyse functional circuits, all input interfaces, output interfaces, modify any template code, and debug any issues to ensure that the electronics outcome:
  - has input sensors that respond correctly to environmental conditions or user input
  - has well-structured code
  - functions as intended
  - is reliable

You should list the tests you performed, analysis of interfaces, and any modifications to components or software code because of tests.

- Explain, either through photos and annotations or through written description, the relevant communication protocols and the behaviour of at least two of the following (choose two which directly apply to your own electronics outcome):
  - 1-Wire Protocol for the DS18B20: how it functions and how to use 1-Wire protocols to interface with it
  - RS232 Serial data communication: what RS232 is and how it works
  - I2C communication: how the I2C protocol works and its advantages

  - Real Time Clock RTC: how it functions and how to use I2C protocols to interface with it
  - Aspects of wireless transfer of information such as checksums
  - Power stabilisation using decoupling capacitors
  - Effects of internal battery resistances with high current loads
  - Software flags, interrupts and how a microprocessor handles interrupts.
- Iteratively improve your outcome throughout your design, development and testing process.
- Justify the choice of communication protocols used.
- Justify the choice of components and subsystems used.
- Describe how you addressed relevant implications.