

**Internal Assessment Resource**

**Digital Technologies & Hangarau Matihiko Level 3**

This resource supports assessment against achievement standards 91900 and 919041

**Standard title:**  91900 Conduct a critical inquiry to propose a digital technologies outcome (6 credits)

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

**Credits:** 12

**Resource title:** Don’t Flush Me

**Resource reference:** Digital Technologies & Hangarau Matihiko 3.1A\_3.5A

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| This resource:* Clarifies the requirements of the achievement standard
* Supports good assessment practice
* Should be subjected to the school’s usual assessment quality assurance process
* Should be modified to make the context relevant to students in their school/kura environment and ensure that submitted evidence is authentic
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| Date version published by Ministry of Education | December 2018 Version 1To support internal assessment from 2019 |
| Authenticity of evidence | Teachers/kaiako must manage authenticity for any assessment from a public source, because students may have access to the assessment schedule or student exemplar material.Using this assessment resource without modification may mean that students’ work is not authentic. The teacher may need to change figures, measurements or data sources or set a different context or topic to be investigated or a different text to read or perform. |

**Internal Assessment Resource**

**Achievement Standards:** 91900 and 91904

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**Teacher/Kaiako guidelines**

The following guidelines are supplied to enable teachers/kaiako to carry out valid and consistent assessment using this internal assessment resource.

Teachers/kaiako need to be very familiar with the outcome being assessed by the achievement standards. The achievement criteria and the explanatory notes contain information, definitions, and requirements that are crucial when interpreting the standard and assessing students/ākonga against it.

**Context/Te Horopaki**

This is an integrated assessment activity supporting a project approach that assesses against two achievement standards.

Water quality is a growing issue within New Zealand communities. Students will conduct a critical inquiry into testing and analysis techniques used to measure water quality within their local community. Students will use insights gained from the inquiry to inform the development of an electronics outcome that enables testing, monitoring and recording of water quality.

This activity requires students to:

* Conduct a comprehensive critical inquiry to propose a digital technologies outcome
* Use complex techniques to develop a refined electronics outcome.

**Conditions/Ngā Tikanga**

It is recommended that students should have multiple checkpoints with their teacher as they work through this assessment activity to ensure they have an opportunity to ask questions and gather feedback.

Conditions of Assessment related to this achievement standard can be found at <http://ncea.tki.org.nz/Resources-for-Internally-Assessed-Achievement-Standards>

**Resource requirements/Ngā Rauemi**

The list of resources for this standard will depend on the teaching and learning programme. Students will need access to appropriate electronics components and equipment that could include:

* Microprocessor such as Atmel/Picaxe/Arduino or *System on a Chip* products such as Raspberry-Pi along with programming cables
* Power supplies
* Electronic components and a range of input components, sensors and output devices
* Multimeters, Breadboard components, Vero board or Kiwi Patch boards or Printed Circuit Board equipment.

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**Student/Akonga instructions**

**Introduction/Kupu Arataki**

Water quality is a growing issue within New Zealand communities. Conduct an inquiry into testing and analysis techniques used to measure water quality within your local community. Use insights gained from your inquiry to inform the development of an electronics outcome that enables testing, monitoring and recording of water quality.

This assessment activity requires you to conduct a critical inquiry into testing and analysis techniques used to measure water quality within your local community. Use insights gained from your inquiry to inform the development of an electronics outcome that enables testing, monitoring and recording of water quality.

In this activity, you will:

* conduct a critical inquiry to propose a digital technologies outcome
* use complex techniques to develop an electronics outcome

You are going to be assessed on how comprehensively you conduct your digital technologies inquiry and how refined your electronics outcome is.

You may work with others to develop 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 work.

Teacher note: Insert due dates and timeframes

**Task/Hei Mahi**

Follow the framework below:

**Inquiry question/s**:

* Decide on an inquiry focus and develop question/s that will guide your inquiry and your electronics outcome. What is your question on water quality? What are you going to find out by using Digital Technologies (electronics technology) to propose a solution?

**Managing project timelines**

* Plan and design your timeframe and inquiry progression and share this with your teacher.

**Find out, research**

* Undertake research to gather background information and ideas from reliable, expert sources.

**Make meaning, organise, analyse**

* Analyse your gathered information. Within your analysis you also need to:
* compare and contrast different perspectives that relate to the inquiry focus
* critique any sources used and evaluate their potential for bias and inaccuracies
* decide how this information will inform your electronics outcome.

**So what?**

* Establish a refined inquiry focus.

**Take action**

* Propose a Digital Technologies outcome to the inquiry focus.
* Explain any relevant risks and ways to mitigate these risks.

For example, estimation, incorrect functionality, computational, factors outside one’s control.

**Reflection, evaluation**

* Evaluating and reporting on the findings from the digital technologies idea or solution in relation to the inquiry question(s). Make sure your evaluation makes links to:
* critiquing the accuracy, relevance, reliability, and/or significance of the findings
* discussing possible future opportunities relating to the inquiry focus and explaining the possible impacts of these opportunities
* considering possible issues relating to the inquiry focus and suggesting areas for improvement, extension, and/or follow-up
* evaluating the strengths and weaknesses of the proposed digital technologies outcome.

**Effectively Managing milestones and Inquiry progression**

Establish key milestones for your inquiry and a means for effectively managing your progress against these key milestones (for example, using a project management tool such as Trello, diary, stickies, online calendar).

**When developing your Electronics Outcome:**

* Use appropriate resources and techniques to develop a functional outcome that performs to specifications and 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):
	+ implementing communication protocols e.g. I2C, serial communications
	+ wireless transfer of information
	+ feedback control
	+ implementing software flags and interrupts
	+ CAD design, 3D printing/CNC, PCB
	+ filtering, noise suppression and EMI.
* 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

**Assessment schedule/Mahere Aromatawai: Digital Technologies & Hangarau Matihiko 91904 - Don’t Flush Me**

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| **Evidence/Judgements for Achievement/Paetae** | **Evidence/Judgements for Achievement with Merit/Kaiaka** | **Evidence/Judgements for Achievement with Excellence/Kairangi** |
| Use complex techniques to develop an electronics outcome.The student has:* used appropriate resources and techniques to develop a functional outcome

Student has developed a functional electronics outcome that meets specifications. Each interface works, and the student is able to demonstrate a working Water Quality Monitoring System.* constructed, tested, and analysed functional circuits to ensure that the electronics outcome performs to specifications

Student has shown evidence of:* analysing analogue data gained from conductivity/pH sensor
* constructing, testing, and analysing functional circuits to ensure that the outcome performs to specification
* testing the input interfaces on expected sensor inputs, on expected manual interrupts
* testing the output interfaces to show display on LCD
* modifying code beyond any template or teacher supplied code samples.
* tested, modified, debugged the outcome

The student shows they have tested sensor controlled events and manual interrupt events that allow water quality monitor to work to specifications.* explained the behaviour and function of the electronics outcome

The student has explained the behaviour and function of selected interfaces or components within their electronics outcome**For example (partial evidence)*** EEPROM IC, how it functions and how the student has used I2C protocols to interface with it
* software flags and interrupts and how a microprocessor handles interrupts
* calibration of analogue pH sensor
* explained relevant communication protocols
* explained relevant communication protocols

*The student is able to explain relevant communication protocols "I implemented communication protocols for the I2C. The Inter-integrated Circuit (I2C) Protocol is a protocol intended to allow multiple “slave” digital integrated circuits (“chips”) to communicate with one or more “master” chips. The purpose of the I2C is to..."** addressed relevant implications

The outcome addresses relevant implications, for example:* has well-structured codeThe student's software code is well structured, including variable and constant declarations, code comments etc.
* functions as intended. The student resolves any issues that affect the functioning of the system.
* is reliable. The student addresses concerns about reliability that may include soldering components onto a board, enclosures with mounted components, secure wiring.
* meets all copyright or intellectual property concerns.

*The examples above are indicative samples only* | Use complex techniques to develop an informed electronics outcome.The student has:* used information from testing and analysis to ensure the circuit(s) functions reliably

Student is able to test and show reliability in their electronics outcome. This may include a selection from:* improved analysis and performance of an analogue conductivity/pH sensor
* averaged values and checks against unexpected/invalid inputs from sensors
* well organised breadboard layout with no loose components. Evidence that the system can function in a consistent manner in its intended location
* soldered components on a Vero board or Kiwi Patch board or Printed Circuit boards will provide evidence of improved reliability and robustness as long as the system is proven to work in a consistent manner in its intended location.

*The examples above are indicative samples only* | Use complex techniques to develop a refined electronics outcome.The student has:* undertaken iterative improvement throughout the design, development and testing process
* justified the choice of communication protocols

Student shows evidence of ongoing design, development and testing within the process of constructing the electronics outcome. The student is able to show * multiple instances of iterative development and testing that lead to a functional outcome
* trialling in the outcome's intended location to determine the outcome is fit for purpose
* justifying the choice of communication protocols
* evidence of the project developing in expected stages, and that after a series of investigation, research and trialling it was further developed, tested and refined. This process was evident throughout the project.
* justified the choice of components and subsystems used

The student is able to justify the choice of components**.** They are able to compare competing components, interfaces for the same purpose and justify their decisions in using one over the other.**For example (partial evidence)**“*I decided to use a … to gain data for my water quality monitor system because” …."After analysis of conductivity of water, I was able to apply… calibration to gain industry standard units …this helps to …”**The examples above are indicative samples only* |

Final grades will be decided using professional judgement based on a holistic examination of the evidence provided against the criteria in the achievement standard

**Assessment schedule/Mahere Aromatawai: Digital Technologies & Hangarau Matihiko 91900 - Don’t Flush Me**

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| Evidence/Judgements for Achievement/Paetae | Evidence/Judgements for Achievement with Merit/Kaiaka | Evidence/Judgements for Achievement with Excellence/Kairangi |
| Conduct a critical inquiry to propose a digital technologies outcome.The student has:* decided on an inquiry focus and developed specific inquiry question(s) linked to digital technologies

**For example (partial evidence):** *"How can I create a water quality probe capable of testing and monitoring our local stream over a long period of time?"** undertaken research to gather background information and ideas from reliable, expert sources

The student has used more than one method of research i.e. internet, library, interviews, surveys etc.Student has evidence of refining their initial inquiry focus question(s) as their knowledge about the context increases or as they encounter areas of new interest.* analysed gathered information

**For example (partial evidence):**Student shows a portfolio of evidence around their topic, including evidence of talking to relevant experts, and their analysis of the evidence gained.* established a refined inquiry focus
* proposed a digital technologies outcome to the inquiry

**For example**The student’s portfolio shows how the inquiry focus has been refined from their initial stages, to a specific focus of measurement of water quality. They then develop an outcome proposal based on their findings, that uses their electronics/digital technologies knowledge and skillsets.* explained relevant risks and ways to mitigate these risks

Student has explained risks/difficulties when attempting to accurately measure water quality and how these difficulties can be mitigated.* reported on the findings from the research in relation to the inquiry question(s) and the proposed digital technologies outcome.

Student has reported on the findings from the research in relation to the water quality inquiry question(s) and the proposed digital technologies outcome. This may include discussion on similar solutions and the scope and seriousness of the problem.*The examples above are indicative samples only* | Conduct an in-depth critical inquiry to propose a digital technologies outcome.The student has:* compared and contrasted different perspectives that relate to the inquiry focus

The student has expanded their inquiry to explain the implications and relevant perspectives that impact on the focus of their inquiry.**For example (partial evidence)**The student has compared different people’s opinion on what 'clean' water is, including local council guidelines on the issue and the council viewpoint on ‘clean water’.* discussed possible future opportunities relating to the inquiry focus and explaining the possible impacts of these opportunities

**For example (partial evidence)**How relevant, real-time data on stream health may inform local community groups when dealing with water quality issues. * effectively managed milestones and inquiry progression.
* evaluated the strengths and weaknesses of the digital technologies inquiry focus

Student has evaluated the strengths and weaknesses of their water quality solution, this may include a PMI evaluation of their water quality sensor system they have proposed and whether this will answer the inquiry focus and question.*The examples above are indicative samples only* | Conduct a comprehensive critical inquiry to propose a digital technologies outcome.The student has:* critiqued any sources used and evaluated their potential for bias and inaccuracies

This may include bias in what constitutes 'clean' water.* considered possible issues relating to the proposed outcome and suggested areas for improvement, extension, and/or follow-up

The student considered how to improve the inquiry and water quality sensor. This may include improvements or additional components that will allow greater accuracy and reliability in water quality measurement.* critiqued the accuracy, relevance, reliability, and/or significance of the findings

Student has critiqued the accuracy/relevance/ reliability and/or significance of the findings they have discovered.**For example (partial evidence):** The student has compared a range of sources with differing opinions and evaluated the accuracy or reliability of evidence from differing viewpoints. *The examples above are indicative samples only* |

Final grades will be decided using professional judgement based on a holistic examination of the evidence provided against the criteria in the achievement standard.