# Computing Technology Stage 5 (Year 9) – sample assessment task 3 notification



Contents

[Task description 2](#_Toc135315640)

[Submission details 2](#_Toc135315641)

[Steps to success 3](#_Toc135315642)

[What is the teacher looking for? 5](#_Toc135315643)

[Marking guidelines 6](#_Toc135315644)

[Student-facing rubric 7](#_Toc135315645)

[Student support material 12](#_Toc135315646)

[Additional information 13](#_Toc135315647)

[Assessment advice 13](#_Toc135315648)

[Assessment as a learning opportunity 13](#_Toc135315649)

[Support and alignment 15](#_Toc135315650)

[Evidence base 17](#_Toc135315651)

## Task description

**Type of task:** research report into a mechatronic and/or automated system.

**Outcomes being assessed:**

* understands how innovation, enterprise and automation have inspired the evolution of computing technology **CT5-EVL-01**
* applies computational, design and systems thinking to the development of computing solutions **CT5-THI-01**

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**Suggested weighting: 20%**

Research and examine a mechatronic and/or automated system and create a report showing how it can be developed into a computing solution.

Investigate a real-world problem or need that can be solved by mechatronic and/or automated systems. Your task will include:

* identifying stakeholders and existing solutions
* breaking down the mechatronic and/or automated systems into manageable parts and functional and non-functional requirements
* creating flowcharts and pseudocode to represent how this system will work.
* developing test criteria and proposing modifications to increase the effectiveness of the system.

## Submission details

Students can submit their research report including mind map/concept map digitally.

## Steps to success

Table 1 – assessment preparation schedule

|  |  |
| --- | --- |
| Steps | What I need to do/when I need to do it |
| Develop a system introduction for the chosen mechatronic and/or automated system | * Write a system introduction that identifies a real-world problem or need that can be solved by mechatronic and/or automated systems that you will research.
* Identify the needs of stakeholders for the chosen mechatronic and/or automated system.
* Evaluate existing solutions to the problem or related problems for the chosen mechatronic and/or automated system.
 |
| Develop a table to document the movement of data in the chosen mechatronic and/or automated system | * Describe inputs, storage, transmission, processes and outputs used in the chosen mechatronic and/or automated system.
 |
| Develop a mind map of the system of the chosen mechatronic and/or automated system | * Develop a mind map to break down the chosen mechatronic and/or automated system into manageable parts.
 |
| Develop a table to consider the physical components of the chosen mechatronic and/or automated system model | * Identify the control systems, components, microcontrollers, co-processors, sensors, actuators, end effectors and manipulators the model of the system will use.
 |
| Specify the functional and non-functional requirements of the chosen mechatronic or automated system | * Specify the functional requirements including stating the purpose of a system, describing user cases and developing test cases of inputs and expected outputs.
* Specify the non-functional requirements of the mechatronic or automated system.
 |
| Develop flowcharts and pseudocode of the chosen mechatronic and/or automated system | * Represent algorithms using flowcharts and pseudocode that the model of the mechatronic and/or automated system will use.
 |
| Develop test criteria for the chosen mechatronic and/or automated system  | * Develop test criteria for components that the model of the system will use.
 |
| Propose software and hardware modifications of the chosen mechatronic and/or automated system | * Propose software and hardware modifications to increase the effectiveness of the mechatronic and/or automated system.
 |

## What is the teacher looking for?

This task will require students to correctly choose a mechatronic and/or automated system to research. This chosen system will be investigated and examined. Through completing the steps, students begin planning on how to model the system with physical components.

When understanding how innovation, enterprise and automation have inspired the evolution of mechatronic and automated systems, students also build connection to the computational, design and systems thinking required to develop these systems.

Breaking down the system into functional and non-functional components, developing a mind map and understanding how the data moves between components assists in later developing algorithms and testing criteria.

Understanding how the system will computationally work is developed when the student represents the system in algorithms such as flowcharts and pseudocode. Ways to test the model of the system will be examined in developing test criteria and predicting software and hardware modifications.

## Marking guidelines

Table 2 – assessment marking guidelines

|  |  |
| --- | --- |
| Grade | Marking guideline descriptors |
| A | * The student demonstrates an extensive understanding of the influence of enterprise, innovation and automation on the evolution of computing technology.
* The student develops highly effective computing solutions using computational, design and systems thinking skills.
 |
| B | * The student demonstrates a thorough understanding of the influence of enterprise, innovation and automation on the evolution of computing technology.
* The student develops effective computing solutions using computational, design and systems thinking skills.
 |
| C | * The student demonstrates a sound understanding of the influence of enterprise, innovation and automation on the evolution of computing technology.
* The student develops sound computing solutions using computational, design and systems thinking skills.
 |
| D | * The student demonstrates a basic understanding of the influence of enterprise and innovation on the evolution of computing technology.
* The student develops basic computing solutions using computational, design or systems thinking skills.
 |
| E | * The student identifies the evolution of, and/or innovations in, computing technology.
 |

## Student-facing rubric

Table 3 – rubric for assessment

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Criteria | Limited | Basic | Sound | High | Outstanding |
| Criteria 1System Introduction | Students incorrectly identify one existing mechatronic and/or automated system. | Students identifies one existing mechatronic and/or automated system, identifies stakeholders and outlines an existing or related problem. | Students outlines one existing mechatronic and/or automated system, identifies stakeholders and describes existing solutions to the problem or related problems. | Students accurately explain one existing mechatronic and/or automated system, correctly identifies stakeholders and correctly explains existing solutions to the problem or related problems. | Students accurately explain in detail one existing mechatronic and/or automated system, correctly identifies stakeholders and evaluates existing solutions to the problem or related problems. |
| Criteria 2Inputs, storage, transmission, processes and outputs | Students provide limited or no understanding of inputs, storage, transmission, processes and outputs. | Students identify some inputs, storage, transmission, processes and outputs. | Students provide accurate knowledge and outline inputs, storage, transmission, processes and outputs. | Students correctly describe all inputs, storage, transmission, processes and outputs for the chosen system. | Students provide an extensive and detailed explanation of all inputs, storage, transmission, processes and outputs for the chosen system. |
| Criteria 3Mind map | Students provide limited or no understanding of creating a mind map to show system in manageable parts. | Students identify some components of the system in creating a mind map. | Students provide accurate knowledge and understanding of the system in creating a mind map. | Students correctly break the system into manageable parts and have many branches structured accurately in the mind map. | Students correctly and extensively break the system into detailed manageable parts and have many branches structured accurately in the mind map. |
| Criteria 4Control systems, components, microcontrollers, co-processors, sensors, actuators, end effectors and manipulators | Students provide limited or no understanding of control systems, components, microcontrollers, co-processors, sensors, actuators, end effectors and manipulators. | Students identify some control systems, components, microcontrollers, co-processors, sensors, actuators, end effectors and manipulators. | Students provide accurate knowledge and outline control systems, components, microcontrollers, co-processors, sensors, actuators, end effectors and manipulators. | Students correctly describe all control systems, components, microcontrollers, co-processors, sensors, actuators, end effectors and manipulators for the chosen system. | Students provide an extensive and detailed explanation of control systems, components, microcontrollers, co-processors, sensors, actuators, end effectors and manipulators for the chosen system. |
| Criteria 5Functional and non-functional requirements | Functional and non-functional requirements are incomplete or some aspects are listed. | Functional and non-functional requirements identify some components of the purpose, user cases and test cases. | Functional and non-functional requirements outline the purpose of a system, outline user cases and test cases. | Functional and non-functional requirements describe the purpose of a system, user cases and developing test cases of inputs and expected outputs. | Functional and non-functional requirements are detailed, objective and explains the purpose of a system, user cases and developing test cases of inputs and expected outputs. |
| Criteria 6Represent algorithms using flowcharts and pseudocode | Students provide a limited or incomplete pseudocode and flowchart for one part of a chosen mechatronic and/or automated system. | Students provide pseudocode and flowchart with an attempt to address some aspect for one part of a chosen mechatronic and/or automated system. | Students provide a satisfactory step-by-step pseudocode and flowchart using symbols that addresses some of the operations for one part of a chosen mechatronic and/or automated system. | Students provide an accurate step-by-step pseudocode and flowchart using correct symbols for one part of a chosen mechatronic and/or automated system. | Students provide an excellent, methodical and accurate step-by-step pseudocode and flowchart using correct symbols for one of more parts of a chosen mechatronic and/or automated system. |
| Criteria 7Develop test criteria for components and propose software and hardware modifications | Test criteria is incomplete and/or lists some areas of success or for improvement. | Test criteria for components of the automated and/or mechatronic system have been identified. | Test criteria for components are outlined. Software and hardware modifications to increase the effectiveness of the automated and/or mechatronic system have been outlined. | Descriptive test criteria for components is used and the students propose software and hardware modifications to increase the effectiveness of the automated and/or mechatronic system. | There are extensive test criteria for components and the students propose accurate software and hardware modifications to increase the effectiveness of the automated and/or mechatronic system. |

## Student support material

Resources include:

* Teacher resource with scaffolds, templates and graphic organisers for completing the task
* Teacher resource with additional information to support student understanding
* Program of learning.

## Additional information

This resource has been developed to assist teachers in NSW Department of Education schools to create learning that is contextualised to their classroom. It can be used as a basis for the teacher’s own program, assessment, or scope and sequence, or be used as an example of how the new curriculum could be implemented. The resource should be used with timeframes that are created by the teacher to meet the overall schedules of assessment.

For additional support or advice, contact the TAS curriculum team by emailing TAS@det.nsw.edu.au.

### Assessment advice

Assessment is a powerful tool to measure student learning and plan for the next stages in the learning process. Some considerations in using parts of this assessment notification are:

* Consider the skills, knowledge, and understanding students need to complete the task, and see where there are opportunities for them to refine these through ongoing feedback in the learning sequences associated with the assessment task.
* Ensure the language and readability of the task presents an appropriate challenge for the students the task is being used with. Direct, plain English will allow the greatest number of students to access the task independently.
* Marking guidelines should directly reflect the success criteria and outcomes of the task and align with appropriate levels of achievement for the relevant stage.
* When constructing or adjusting the marking guidelines and/or rubric, try to keep active verbs like ‘do’, ‘say’, ‘make’, or ‘write’ in mind to measure student performance at each level. This will help to avoid subjective language.

### Assessment as a learning opportunity

Assessment can provide ways for students to use formal and informal feedback and self-assessment to help them understand where they are in their learning, where they are going, and how they are going to get there. It is essential that students receive feedback on their performance in the task and have opportunity to clarify and plan the next steps in learning.

* Clear and explicit marking rubrics can support effective self-assessment in relation to the learning intentions and success criteria assisting students to become owners of their own learning. Students can then build their capacity for individual goal setting, which includes students asking questions such as, ‘What do I need to improve?’ and ‘What is my next step?’ ([CESE Growth goals setting – what works best in practice](https://education.nsw.gov.au/about-us/educational-data/cese/publications/practical-guides-for-educators/growth-goal-setting)).
* Greater learning gains may be made when teachers provide explicit descriptive feedback to students in a timely manner. This feedback supports students in forming their learning goals as well as helping the teacher to plan for the next iteration of the teaching and learning cycle.

#### Differentiation advice

Differentiated learning can be enabled by differentiating the assessment approach to content, process, and product. Reasonable adjustments of assessment for students with disability is a legal requirement under the [*Disability Standards for Education 2005* (Cth)](https://www.dese.gov.au/disability-standards-education-2005). For students with a disability, adjustment in assessment tasks should be made through the [Collaborative curriculum planning](https://educationstandards.nsw.edu.au/wps/portal/nesa/k-10/diversity-in-learning/special-education/collaborative-curriculum-planning) process. For more information on differentiation, go to [Differentiating learning](https://education.nsw.gov.au/teaching-and-learning/professional-learning/teacher-quality-and-accreditation/strong-start-great-teachers/refining-practice/differentiating-learning) and [Differentiation](https://education.nsw.gov.au/campaigns/inclusive-practice-hub/primary-school/teaching-strategies/differentiation). When using this resource, teachers can use a range of [adjustments](https://education.nsw.gov.au/teaching-and-learning/disability-learning-and-support/personalised-support-for-learning/adjustments-to-teaching-and-learning) to ensure a personalised approach to student learning.

* Some common adjustments are available through the [Inclusive Practice hub assessment and reporting](https://education.nsw.gov.au/campaigns/inclusive-practice-hub/all-resources/secondary-resources/other-pdf-resources/nesa-assessment-and-reporting) site.
* The [HPGE Differentiation Adjustment Tool](https://education.nsw.gov.au/teaching-and-learning/high-potential-and-gifted-education/supporting-educators/implement/differentiation-adjustment-strategies) and [Differentiation Package](https://schoolsnsw.sharepoint.com/sites/HPGEHub/SitePages/Home.aspx#first-time-access-to-hpge-resources) can assist teachers to decide how to provide extension and additional challenge for High Potential and Gifted (HPG) students.

The steps below may be useful to consider when creating access opportunities for all students:

* remove unnecessary words or images
* simplify any tricky words or make a glossary of subject specific words
* reduce the lexical density of the steps and use student friendly language
* chunk large passages of reading or offer alternate ways of representing the information, such as a visual
* make the task description a checklist with numbered steps
* limit options and/or reduce the number of choices students need to make independently.

### Support and alignment

**Resource evaluation and support**: all curriculum resources are prepared through a rigorous process. Resources are periodically reviewed as part of our ongoing evaluation plan to ensure currency, relevance, and effectiveness. For additional support or advice contact the TAS curriculum team by emailing TAS@det.nsw.edu.au.

**Alignment to system priorities and/or needs:** [School Excellence Policy](https://education.nsw.gov.au/policy-library/policies/pd-2016-0468), [School Success Model.](https://education.nsw.gov.au/public-schools/school-success-model/school-success-model-explained)

**Alignment to the School Excellence Framework**: this resource supports the [School Excellence Framework](https://education.nsw.gov.au/teaching-and-learning/school-excellence-and-accountability/sef-evidence-guide/resources/about-sef) element of assessment (formative assessment, summative assessment, student engagement).

**Alignment to Australian Professional Teaching Standards**: this resource supports teachers to address [Australian Professional Teaching Standards](https://educationstandards.nsw.edu.au/wps/portal/nesa/teacher-accreditation/meeting-requirements/the-standards/proficient-teacher) 5.1.2, 5.4.2.

**Consulted with**: Curriculum and Reform and subject matter experts

**NSW Syllabus**: Computing Technology 7–10

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**Related resources**: Further resources to support Computing Technology Stage 5 can be found on the [TAS curriculum page](https://education.nsw.gov.au/teaching-and-learning/curriculum/tas).

**Professional learning**: relevant professional learning is available through the TAS statewide staffroom.

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## Evidence base

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