Computing Technology Stage 5 (Year 9 or 10) – sample assessment task 1 notification

Modelling networks and social connections

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# About this resource

## Purpose of resource

This sample assessment task unpacks how teachers can assess students in the focus area Modelling networks and social connections for Computing Technology 7–10.

## Target audience

This resource can be used to support teachers with effective syllabus implementation of Computing Technology 7–10.

## When and how to use

This resource is designed for assessing students in the focus area Modelling networks and social connections. The resource can be adapted to suit the context of the school. This is sample assessment task 1 Teachers can also refer to the sample scope and sequence and assessment schedule. The task is weighted at 50% and requires students to create a physical model and accompanying documentation of a smart home.

# Task description

**Type of task**: develop a physical model and accompanying documentation for a smart home.

**Outcomes being assessed**:

A student:

* selects and applies safe, secure and responsible practices in the ethical use of data and computing technology **CT5-SAF-01**
* applies iterative processes to define problems and plan, design, develop and evaluate computing solutions **CT5-DPM-01**
* understands how innovation, enterprise and automation have inspired the evolution of computing technology **CT5-EVL-01**

[Computing Technology 7–10 Syllabus](https://curriculum.nsw.edu.au/syllabuses/computing-technology-7-10-2022) © NSW Education Standards Authority (NESA) for and on behalf of the Crown in the State of New South Wales, 2022.

**Suggested weighting**: 100%

Design and implement a functional smart home model showcasing various automated functionalities that enhance daily living.

This task will include researching existing smart home technologies. Your smart home model will have a specific purpose such as energy efficiency, security, health, entertainment, accessibility and productivity. You will develop documentation that will show how the automated functions of the smart home aligned with this purpose.

By integrating microcontrollers and compatible devices, you will create a network that enables seamless interaction among components like sensors and actuators. The project will culminate in the construction, testing and demonstration of smart home solutions, along with your reflections on the design process and the challenges encountered.

## Submission details

The physical model will be demonstrated to the class and accompanying documentation submitted digitally.

## Steps to success

Table 1 – assessment preparation schedule

|  |  |
| --- | --- |
| Steps | What I need to do |
| Research smart home technologies | * Investigate existing smart home technologies and innovations |
| Develop a purpose | * Choose a purpose for your smart home network. Examples include energy efficiency, home security, health, entertainment, accessibility and productivity * Identify features and functions related to the theme and brainstorm potential automated processes |
| Define project requirements and consider non-functional requirements | * Define 3 automated functions for your smart home model * Specify the nodes in your network, their functions and the data communicated and the manual process that this function automates * Discuss non-functional requirements, including security considerations during data transmission and storage * Address potential issues impacting project development, such as time, resources and budget constraints |
| Define functional requirements | * Detail how the chosen functions will work within the smart home model * Define the role of each component in the network |
| Sketch and model a network | * Sketch and label a design for the physical model of your smart home * Create a network diagram illustrating the arrangement and connections of the technology in your smart home |
| Research and define a network | * Research technologies compatible with microcontrollers for collecting inputs and performing required outputs * Compose a list of equipment and parts required for the construction of the smart home |
| Prototype a network | * Design the code for the microcontroller * Use simulation software to create a prototype of the smart home network |
| Construct and implement a network | * Construct the physical model for your smart home * Source and create any physical resources needed for the system, for example microcontrollers, cables, sensors and actuators * Connect microcontrollers to additional sensors or actuators using wires or expansion boards |
| Test and evaluate | * Code and test each automated function and test in the online simulator * Upload the code to the microcontroller and conduct real-world testing |
| Demonstrate and reflect | * Demonstrate the smart home model to peers * Compile a report summarising challenges faced, solutions implemented and the overall learning experience |

# What is the teacher looking for?

To meet the requirements of this task, students need to demonstrate the following skills and knowledge:

1. Research

Conduct thorough research into smart home technologies, showing a clear understanding of functionality and innovations relevant to their model.

1. Purpose development

Develop a clear, focused purpose for their smart home model with well-defined features and automated processes that align with their chosen theme (for example, security or energy efficiency).

1. Project requirements and non-functional considerations

Define at least 3 automated functions for their model, including specifications of network nodes, data communication processes and attention to non-functional requirements, such as security, reliability and resource constraints.

1. Functional requirements

Clearly explain how each automated function works and define the role of each component, demonstrating a strong understanding of how functions contribute to the overall purpose.

1. Sketch and model a network

Create a detailed, coherent sketch and network diagram that accurately represents all components, their positions and connections, providing clarity on the network’s setup.

1. Research and design a network

Conduct thorough research on compatible technologies, producing a complete and accurate list of all necessary equipment and parts for constructing the smart home model.

1. Prototyping

Design functional code for the microcontroller and create a working prototype using simulation software, demonstrating a strong grasp of coding principles and troubleshooting.

1. Construct and implement a network

Build a functional model, integrating all components (sensors, actuators) to create a fully operational network that supports the defined automated functions.

1. Test and evaluate

Conduct comprehensive testing and evaluation for each function, making refinements to improve performance and ensure the network functions as intended.

1. Demonstrate and reflect

Present a clear, engaging demonstration of the smart home model and provide a reflective report that thoughtfully discusses challenges, solutions and learning experiences from the project.

# 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 * skilfully applies appropriate iterative processes to produce computing solutions * selects and applies safe, secure and ethical practices in the use of data * selects relevant data, media and processes to effectively communicate information in a range of contexts |
| B | The student:   * demonstrates a thorough understanding of the influence of enterprise, innovation and automation on the evolution of computing technology * applies appropriate iterative processes to produce computing solutions * selects and applies safe, secure and ethical practices in the use of data * selects relevant data, media and processes to communicate appropriate information in a range of contexts. |
| C | The student:   * demonstrates a sound understanding of the influence of enterprise, innovation and automation on the evolution of computing technology * applies iterative processes to produce computing solutions * applies safe, secure and ethical practices in the use of data * selects appropriate data, media and processes to communicate information in a range of contexts. |
| D | The student:   * demonstrates a basic understanding of the influence of enterprise and innovation on the evolution of computing technology * uses processes to produce computing solutions * uses data safely and responsibly * uses data to communicate basic information. |
| E | The student:   * identifies the evolution of, and/or innovations in, computing technology * identifies processes that may produce a computing solution * works safely with data * uses data to communicate information in a very limited way. |

# Student-facing rubric

Table 3 – rubric for assessment

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Criteria | Limited | Basic | Sound | High | Outstanding |
| Research | Shows minimal research into smart home technologies, demonstrating little to no understanding of their functionality. | Researches a basic range of smart home technologies with some gaps in understanding their purpose and potential. | Adequately researches common smart home technologies, providing a general overview of their capabilities. | Investigates several relevant smart home technologies and innovations, showing a strong understanding of their use and potential. | Thoroughly investigates a wide range of smart home technologies and innovations, demonstrating deep insight into their functionality and potential. |
| Purpose development | Elementary explanation of purpose, with few or no features and automated processes identified. | Selects a simple purpose with basic features and automated processes identified, with minimal thought given to manual processes. | Chooses a relevant purpose and identifies basic features and automated processes, with some consideration of manual processes. | Selects an appropriate purpose for the smart home network, identifying multiple useful features and automated processes, with good consideration of manual processes. | Selects a highly relevant purpose for the smart home network, identifying comprehensive features and innovative automated processes, with a clear analysis of manual processes to be automated. |
| Project requirements and non-functional considerations | Provides minimal or no specification of network nodes or data communication, and very limited explanation of non-functional requirements. | Defines fewer than 3 automated functions, with basic or unclear network nodes and data communication, and limited consideration of non-functional requirements or project constraints. | Defines 3 automated functions, specifies basic network nodes and data communication, with satisfactory attention to non-functional requirements and limited consideration of security and project constraints. | Defines 3 solid automated functions, specifies network nodes and data communication, with good attention to non-functional requirements and some discussion of security and project constraints. | Clearly defines 3 innovative automated functions, specifying network nodes, data communication and detailed consideration of non-functional requirements, including thorough security analysis and project constraints. |
| Functional requirements | Elementary explanation of the functions or definition of component roles within the network. | Provides a basic explanation of the functions, with some gaps in defining component roles. | Soundly explains how the functions will work, with definitions of component roles in the network. | Explains the functions and roles of most components within the smart home model with a high level of detail. | Provides a detailed explanation of how each function operates within the smart home model, clearly defining the roles of all components in the network. |
| Sketch and model a network | Very limited sketch or network diagram, with elementary representation of components or connections. | Provides a simple sketch with limited labelling and a basic network diagram, missing some key components or connections. | Produces an adequate sketch and a basic network diagram, illustrating key components and connections. | Creates a clear and detailed sketch with a well-organised network diagram that accurately represents most of the connections. | Produces a highly detailed and well-labelled sketch of the physical model, alongside a comprehensive and accurate network diagram showing all connections. |
| Research and designing | Minimal research into technologies, with an incomplete or inaccurate list of equipment and parts. | Researches some technologies but provides an incomplete or basic list of equipment and parts. | Adequately researches technologies and provides a basic list of required equipment and parts. | Conducts good research into compatible technologies, listing most of the necessary equipment and parts. | Conducts thorough research into compatible technologies, compiling a comprehensive and accurate list of required equipment and parts. |
| Prototyping | Prototype is non-existent or partially completed using simulation software. | Designs basic code for the microcontroller with a basic prototype created using simulation software. | Designs adequate code for the microcontroller and uses simulation software to create a simple smart home network prototype. | Designs effective code for the microcontroller and creates a functional prototype using simulation software. | Designs highly effective code for the microcontroller and uses simulation software to create a realistic and fully functional smart home network prototype. |
| Construct and implement a network | Constructs a partial model or connects some required components, with little integration of sensors and actuators. | Constructs a simple model with minimal integration of sensors and actuators, with some components not functioning as expected. | Constructs a physical model, connecting essential components and integrating some sensors and actuators. | Constructs a functional physical model, sourcing and connecting most components effectively, with good integration of sensors, actuators, and microcontrollers. | Expertly constructs the physical model, sourcing and connecting all necessary components with precision, ensuring smooth integration of sensors, actuators, and microcontrollers. |
| Test and evaluate | Minimal or no testing and evaluation of functions, with few or no refinements made. | Tests some functions with basic evaluation, both in the simulator and real-world, missing key improvements. | Tests and evaluates functions in the simulator and real-world, with basic observations for improvement. | Tests and evaluates most functions effectively in both the simulator and real-world conditions, identifying areas for improvement. | Thoroughly tests and evaluates each automated function in the simulator and in real-world conditions, making refinements as necessary for optimal performance. |
| Demonstrate and reflect | Provides a limited demonstration or report, with little to no relation to the project. | Provides a basic demonstration and report, with minimal reflection on challenges and solutions. | Gives a satisfactory demonstration and a basic report that reflects on the project, including some challenges and solutions. | Provides a clear demonstration and a detailed report reflecting on challenges and solutions, with thoughtful insights on the learning experience. | Delivers a very clear demonstration and produces an in-depth report that critically reflects on challenges, solutions, and key learning outcomes. |

# Student support material

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

# Supporting documentation scaffold

## Initial research and theme selection

Investigate an existing smart home product as inspiration. Summarise the chosen system's name, purpose, users, inputs, processes, storage and outputs.

|  |  |
| --- | --- |
| Smart home product component | Summary |
| System name |  |
| Purpose |  |
| Users |  |
| Inputs |  |
| Processes |  |
| Storage |  |
| Outputs |  |

## Develop the purpose

Choose a purpose for the smart home (for example, energy efficiency, home security, health, entertainment, accessibility or productivity).

Identify features and functions related to the theme, brainstorming potential automated processes.

|  |  |  |  |
| --- | --- | --- | --- |
| Steps | Instructions | Example/guidance | Answer |
| 1. Choose a purpose | Select a main focus for your smart home model, such as energy efficiency, home security, health, entertainment, accessibility or productivity. | Example: for *energy efficiency*, your network could aim to reduce energy consumption through automated lighting or temperature adjustments. |  |
| 1. Identify features and functions | List at least 3 key features that support your chosen purpose. For each feature, brainstorm possible automated processes. | Example: for *security*:   * automated locks * motion-detecting lights * remote surveillance access. | 1.  2.  3. |
| 1. Brainstorm benefits | Explain why these features are important. Consider benefits like improved quality of life, cost savings or environmental impact. | Example: automated lighting saves energy by turning lights off when not in use, reducing energy costs. |  |
| 1. Summarise purpose | Write a summary describing the overall purpose and features of your smart home. | Example: the purpose of this smart home is to enhance home security through automated locks, motion-sensor lights and remote surveillance, providing peace of mind and protection for residents. |  |

## Define functional requirements

Detail how the chosen functions will work within the smart home model and define the role of each component in the network.

|  |  |  |
| --- | --- | --- |
| Task description | Instructions | Answer |
| Automated functions | Identify the 3 automated functions you plan to implement in your smart home model that align with your chosen purpose. | 1.  2.  3. |
| Define nodes and functions | For each automated function, specify the nodes involved (for example sensors, cameras, lights) and describe their roles and the type of data they will communicate. |  |
| Explain data communication | Describe how data will flow between nodes in each function. Identify any data processing needed for actions (for example sensor data to microcontroller to activate response). |  |
| Outline manual process replacement | Briefly describe the manual process each function automates and how automation benefits the system. |  |
| Identify security considerations | Address potential security issues for each function, such as data protection or access controls, to maintain privacy and integrity in the network. |  |

## Project requirements and non-functional constraints

Address potential issues impacting project development, such as time, resources and budget constraints.

|  |  |  |  |
| --- | --- | --- | --- |
| Task description | Instructions | Example/guidance | Answer |
| Identify time constraints | Describe any time limitations that may affect project completion. | Example: limited time for testing could impact how thoroughly each automated function is evaluated before the final presentation. |  |
| Consider resources constraints | List the resources available and note any limitations, such as availability of specific equipment or technical support. | Example: limited access to advanced sensors may require you to use basic models, potentially impacting the accuracy of automated functions. |  |
| Assess budget constraints | Outline your budget and determine if any desired components are too costly, requiring alternatives or simplifications. | Example: a low budget restricts you from using high-quality actuators, so you may use basic motors instead for automated door locks. |  |
| Plan for potential issues | Identify any foreseeable issues with development, such as potential technical difficulties or limited expertise in specific areas. | Example: limited knowledge of programming might lead to challenges in coding the microcontroller for specific automation functions. |  |

## Sketch and model a network

|  |  |
| --- | --- |
| Steps | Process |
| 1. Create physical model sketch | Draw a labelled sketch of your smart home model, clearly showing all components and their positions. Include the layout of rooms or areas that require devices. |
| 1. Label components | Label each component in your sketch (for example, sensors, microcontrollers, lights) with its function and placement, indicating how it contributes to your purpose. |
| 1. Create a network diagram | Use a diagram format (such as flowchart symbols) to show the network’s arrangement, displaying connections between devices and data flow pathways. |
| 1. Define connections and dependencies | For each connection, note how components interact, including dependencies where one device relies on data or action from another. |
| 1. Ensure diagram completeness | Review your sketch and network diagram to ensure all necessary components and connections are represented clearly and consistently. |

## Research and define network

Table 9 – research and define network

|  |  |  |  |
| --- | --- | --- | --- |
| Steps | Instructions | Example/guidance | Answer |
| 1. Research compatible technologies | Investigate technologies compatible with the microcontroller that can collect inputs (for example sensors) and perform outputs (for example lights or alarms) suitable for your model. | Example: research different types of motion sensors and lighting actuators compatible with your microcontroller, considering factors like energy use and reliability. |  |
| 1. List required components | Based on your research, compile a list of all components needed to build your smart home model, including sensors, actuators, wiring and other essentials. | Example: list of required components:   * PIR motion sensor * LED lights * buzzer alarm * jumper wires * breadboard |  |
| 1. Justify component choices | For each component on your list, explain why it was chosen and how it aligns with your smart home’s purpose and functional requirements. | Example: PIR motion sensor was chosen for its reliability and low power consumption, aligning with energy-efficient objectives and functional needs for detecting movement. |  |
| 1. Identify data and power needs | Describe any data or power requirements for each component, including voltage or wiring needs to ensure proper functioning within the network. | Describe any data or power requirements for each component, including voltage or wiring needs to ensure proper functioning within the network. |  |
| 1. Evaluate feasibility | Review your list of components and network setup to assess feasibility based on constraints (for example budget, availability) and make any necessary adjustments. | Example: If budget constraints exist, consider substituting a different sensor or eliminating an optional feature that isn’t essential to the main purpose. |  |

## Reflection

|  |  |  |  |
| --- | --- | --- | --- |
| Steps | Instructions | Example or guidance | Answer |
| 1. Summarise project goals | Briefly restate the main purpose of your smart home project, including the automated functions and how they align with the overall purpose. | Example: the smart home model aimed to enhance security by automating door locks, motion-triggered lights and remote monitoring. |  |
| 1. Describe key challenges | Identify the primary challenges faced during the project, including technical issues, resource constraints, or time limitations. | Example: one major challenge was coding the microcontroller to handle multiple inputs simultaneously, which required troubleshooting and additional research. |  |
| 1. Explain solutions implemented | Discuss the solutions you applied to overcome challenges and any adjustments made to achieve project goals. | Example: to manage simultaneous inputs, we simplified the code logic and implemented a delay function to prevent sensor overlap. |  |
| 1. Evaluate success of each function | Reflect on the effectiveness of each automated function and whether it met the intended purpose, including areas that worked well and areas that may need improvement. | Example: the automated door lock function worked reliably, but the motion sensor’s range was limited, so it didn’t always detect movement effectively. |  |
| 1. Reflect on learning and skills | Summarise the skills or knowledge gained throughout the project, including any programming, design, or troubleshooting skills developed. | Example: this project improved my understanding of network communication and microcontroller programming, especially handling data from multiple input sensors. |  |
| 1. Suggest future improvements | Suggest ways to improve the smart home model or the project process in future versions. | Example: the smart home model aimed to enhance security by automating door locks, motion-triggered lights and remote monitoring. |  |

# 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, or to provide feedback, contact the contact the TAS curriculum team by emailing [TAS@det.nsw.edu.au.](mailto:TAS@det.nsw.edu.au)

**Differentiation:** further advice to support Aboriginal and Torres Strait Islander students, EALD students, students with a disability and/or additional needs and High Potential and gifted students can be found on the [Planning, programming and assessing 7–12](https://education.nsw.gov.au/teaching-and-learning/curriculum/planning-programming-and-assessing-k-12/planning-programming-and-assessing-7-12) webpage. This includes the [Inclusion and differentiation 7–10 advice](https://education.nsw.gov.au/teaching-and-learning/curriculum/planning-programming-and-assessing-k-12/planning-programming-and-assessing-7-12/inclusion-and-differentiation-advice-7-10) webpage.

**Assessment**: further advice to support formative assessment is available on the [Planning, programming and assessing 7–12](https://education.nsw.gov.au/teaching-and-learning/curriculum/planning-programming-and-assessing-k-12/planning-programming-and-assessing-7-12) webpage. This includes the [Classroom assessment advice 7–10](https://education.nsw.gov.au/teaching-and-learning/curriculum/planning-programming-and-assessing-k-12/planning-programming-and-assessing-7-12/classroom-assessment-advice-7-10-). For summative assessment tasks, the [Assessment task advice 7–10](https://education.nsw.gov.au/teaching-and-learning/curriculum/planning-programming-and-assessing-k-12/planning-programming-and-assessing-7-12/assessment-task-advice-7-10) webpage is available.

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

**Alignment to system priorities and/or needs**: [School excellence](https://education.nsw.gov.au/policy-library/policies/pd-2016-0468).

**Alignment to the School Excellence Framework**: this resource supports the [School excellence](https://education.nsw.gov.au/policy-library/policies/pd-2016-0468) elements of curriculum (curriculum provision) and effective classroom practice (lesson planning, explicit teaching).

**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.

**Creation date: 2025**

# Evidence base

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