Enterprise Computing Stage 6 (Year 11) – sample program of learning

Networking systems and social computing

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# Rationale

The NSW Department of Education publishes a range of curriculum support materials, including samples of lesson sequences, scope and sequences, assessment tasks, examinations, student and teacher resource booklets, and curriculum planning and curriculum evaluation templates. The samples are not exhaustive and do not represent the only way to complete or engage in each of these processes. Curriculum design and implementation is a dynamic and contextually-specific process. While the mandatory components of syllabus implementation must be met by all schools, it is important that the approach taken by teachers is reflective of their needs and faculty/school processes.

NESA defines [programming](https://educationstandards.nsw.edu.au/wps/portal/nesa/k-10/understanding-the-curriculum/programming) as the process of ‘selecting and sequencing learning experiences which enable students to engage with syllabus outcomes and develop subject specific skills and knowledge’ (NESA 2022). A program is developed collaboratively within a faculty. It differs from a unit in important ways, as outlined by NESA on their [advice on units](https://educationstandards.nsw.edu.au/wps/portal/nesa/k-10/understanding-the-curriculum/programming/advice-on-units) page. A unit is a contextually-specific plan for the intended teaching and learning for a particular class for a particular period. The organisation of the content in a unit is flexible and it may vary according to the school, the teacher, the class, and the learning space. They should be working documents that reflect the thoughtful planning and reflection that takes place during the teaching and learning cycle. There are mandatory components of programming and unit development, and this template provides one option for the delivery of these requirements. The NESA and department guidelines that have influenced this template are elaborated upon at the end of the document.

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 has suggested timeframes that may need to be adjusted by the teacher to meet the needs of their students.

# Overview

**Description**: This program of learning addresses the focus area of networking systems and social connections. The lessons and sequences in this program of learning are designed to allow students to develop the knowledge and skills to create a network model as a solution to a user’s needs.

During Weeks 1 to 4 of the learning sequence, students gain an introduction to human-centric computing. They examine the effects of disruptive technology on everyday computing, investigate graph and network theory in the design of social networks and describe how apps influence the success of social networking. Students investigate how the development of hardware and software has influenced the adoption of the Internet of Things (IoT) and outline the business and individual cultural characteristics that contribute to the success of start-ups.

Students examine the storage and workflow in enterprise networks. They investigate how the developments in network connectivity and speed have influenced work practices within an enterprise. Students examine the benefits and limitations of digital workflows operating in an enterprise and investigate data storage requirements for an enterprise.

During Weeks 5 to 10 of the learning sequence, students will examine network architecture and infrastructure. They describe key components of an organisation’s information technology infrastructure and describe how transmission media is used in networks.

Students explain factors that interfere with the transmission of data across a computer and social network and investigate ways to improve data flow within a system, considering proximity and modes of connectivity.

Students create a network including designing and modelling a network of interconnected devices for a specific purpose. They apply appropriate project management tools to develop a project and configure devices within a network.

**Duration**: This program of learning is designed to be completed over a period of approximately 10 weeks in 60-minute lesson sequences but can be adapted to suit the school context.

**Explicit teaching**: Suggested learning intentions and success criteria are available for some lessons provided. Learning intentions and success criteria are most effective when they are contextualised to meet the needs of students in the class. The examples provided in this document are generalised to demonstrate how learning intentions and success criteria could be created.

# Outcomes

A student:

* describes how systems are used in a range of enterprises **EC-11-01**
* describes the function of data and information within enterprise computing systems **EC-11-02**
* describes how data is safely and securely collected, stored and manipulated when developing enterprise computing systems **EC-11-03**
* describes how data is used in enterprise computing systems **EC-11-04**
* applies tools and resources to analyse datasets **EC-11-05**
* explains how innovative technologies have influenced enterprise computing systems **EC-11-06**
* explores the social, ethical and legal implications of the application of enterprise computing systems on the individual, society and the environment **EC-11-07**
* selects and uses tools and resources to design and develop an enterprise computing system **EC-11-08**
* documents the management and evaluates the development of an enterprise solution **EC-11-09**
* investigates the effectiveness of an enterprise computing system **EC-11-10**
* communicates an enterprise computing solution to an intended audience **EC-11-11**

[Enterprise Computing 11–12 Syllabus](https://curriculum.nsw.edu.au/learning-areas/tas/enterprise-computing-11-12-2022/overview) © NSW Education Standards Authority (NESA) for and on behalf of the Crown in right of the State of New South Wales, 2022.

**Prior to planning for teaching and learning, please consider the following:**

**Engagement**

* How will I provide authentic, relevant learning opportunities for students to personally connect with lesson content?
* How will I support every student to grow in independence, confidence and self-regulation?
* How will I facilitate every student to have high expectations for themselves?
* How will I identify and provide the support each student needs to sustain their learning efforts?

**Representation**

* What are some different ways I can present content to enable every student to access and understand it?
* How will I identify and address language and/or cultural considerations that may limit access to content for students?
* How will I make lesson content and learning materials more accessible?
* How will I plan learning experiences that are relevant and challenging for the full range of students in the classroom?

**Expression**

* How will I provide multiple ways for students to respond and express what they know?
* What tools and resources can students use to demonstrate their understanding?
* How will I know every student has understood the concepts and language presented in each lesson?
* How will I monitor if every student has achieved the learning outcomes and learning growth?

# Lesson sequence and details

## Week 1

Table 1 – lesson sequence and details

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Outcomes and content | Teaching and learning activities | Evidence of learning | Differentiation/ adjustments | Registration and evaluation notes |
| **EC-11-01**  **EC-11-02**  Students:   * investigate the effects of disruptive technology on everyday computing   Including:   * effects on the individual * innovations in infrastructure, hardware and software * trends and technology buzzwords. | **Learning intention**  Understand human-centric computing.  **Success criteria**   * I can investigate the effects of disruptive technology on everyday computing.   **Teaching and learning activity**  As a class, students watch the[TEDx Talk on disruptive technology](https://www.youtube.com/watch?v=pk9RVBwiFbM) (12:07).  **Activity 1:** [brainstorm](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/542#.ZC4skSv0RLg.link) examples of disruptive technology you have encountered in daily life.  **Activity 2:** define key concepts:   * disruptive technology * everyday computing.   **Activity 3:** describe the effects of disruptive technology on the individual.  Describe how job security may be challenged by disruptive technology.  **Activity 4**: research and provide screen shot example(s) of each type of disruptive technology that you are familiar with. Classifying the disruptive technology as infrastructure, hardware or software that have impacted society.  **Activity 5:** complete 3 examples for each disruptive technology that you regularly use.  **Activity 6**: as a class, students watch a video on [What are disruptive technologies?](https://www.youtube.com/watch?v=S86mAHwiij4) (3:45)  Examine the [table of disruptive technologies](https://www.dropbox.com/s/6ukp4d6q3z1douj/Tech-Foresight-Table-of-Disruptive-Technologies.pdf?dl=0) discussed in the video.  Students list 10 disruptive technologies and their categories.  Students are grouped in small teams and discuss how all of these disruptive technology developments will affect everyday computing.  Student teams choose one of these future technologies and discuss using critical thinking.  **Activity 7**: students complete a table of trends and buzzwords used in Networking systems and social connections. | Students can identify and define disruptive technology.  Students can list 10 examples of disruptive technologies and classify these.  Students examine disruptive technology on everyday computing and can describe the effects on an individual.  Students become familiar with trends and buzzwords used in Networking systems and social connections. | This section is also for use in school when making adjustments to support all students to achieve in their learning.  Provide visual and/or multimedia examples and check understanding of concepts.  Prompt student discussion with real-world scenarios and examples.  Include multiple opportunities to respond, for example:   * verbally * individually * partner turn and talk * non-verbally * gesture * response cards. |  |

## Week 2

Table 2 – lesson sequence and details

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Outcomes and content | Teaching and learning activities | Evidence of learning | Differentiation/ adjustments | Registration and evaluation notes |
| **EC-11-04**  **EC-11-05**  Students:   * investigate the application of graph and network theory in the design of social networks * describe how web applications and dedicated apps for mobile devices influence the success of social networking * investigate how the development of hardware and software has influenced the adoption of the Internet of Things (IoT) and the Internet of Me (IoMe)   Including:   * impact on the individual * impact on enterprise, including edge computing * hardware infrastructure * software protocols * data backup * regulation, compliance and cybersecurity * outline the business and individual cultural characteristics that contribute to the success of start-ups. | **Learning intention**  Understand human-centric computing.  **Success criteria**   * I can investigate the application of graph and network theory in the design of social networks. * I can describe how web applications and dedicated apps for mobile devices influence the success of social networking. * I can investigate how the development of hardware and software has influenced the adoption of the Internet of Things (IoT) and the Internet of Me (IoMe).   **Teaching and learning activity**  Students watch a variety of videos on graph and network theory in the design of social networks.   * [What is Social Network Analysis? (3:45)](https://www.youtube.com/watch?v=xT3EpF2EsbQ) * [Social Network Analysis: Graph theory (8:38)](https://www.youtube.com/watch?v=natjwmIGoxQ) * [Basic Concepts in Graph Theory (16:36)](https://www.youtube.com/watch?v=ZHqQDA3be-k).   **Activity 8:** as a class, students read and discuss [social network analysis](https://en.wikipedia.org/wiki/Social_network_analysis).  **Activity 9:** students use [Gephi](https://gephi.org/) to visualise a graph.  Create a csv file showing the social media connections you have in your year group. Follow a [tutorial](https://medium.com/swlh/visualizing-databases-using-gephi-591c9530c981) to understand how you can visualise your data.  **Activity 10:** students useFirefox Lightbeam analysis of browser and data tracking habits.  Students install and monitor their browser habits over the course of a few lessons.  **Activity 11:** as a class, students read [What is the IoT?](https://www.zdnet.com/article/what-is-the-internet-of-things-everything-you-need-to-know-about-the-iot-right-now/) and watch the [movie (9:15)](https://www.zdnet.com/article/what-is-the-internet-of-things-everything-you-need-to-know-about-the-iot-right-now/) on the webpage.  As a class students watch [an explanation of IoT](https://www.youtube.com/watch?v=LlhmzVL5bm8) (3:21).  Teacher led discussion on what are common IoT devices you are using.  Students define in their own words what is meant by the Internet of Things (IoT).  **Activity 12:** IoT Innovation Challenge  This activity introduces high school students to IoT and incorporates project management, design thinking and hands-on experience in creating an immersive and interactive IoT product.  **Activity 13:** as a class, students read [The Internet of Me: When the Consumer Becomes the Electronics](https://www.wired.com/brandlab/2018/01/internet-consumer-becomes-electronics/).  Define in your own words what is meant by the Internet of Me (IoMe).  **Activity 14:** students read about and investigate newly developed technology, including [Neuralink](https://www.forbes.com/sites/qai/2022/12/07/elon-musks-neuralink-brain-implant-could-begin-human-trials-in-2023/?sh=60a31aa8147c) and [5G](https://www.zdnet.com/topic/5g-what-it-means-for-iot/) technology.  Students write a summary on the new frontiers in networking systems.  **Activity 15:** students read about [10 edge computing use case examples](https://stlpartners.com/articles/edge-computing/10-edge-computing-use-case-examples/) and [edge computing in enterprise](https://appinventiv.com/blog/edge-computing-in-enterprise/).  Summarise how edge computing is impacting enterprise systems.  **Activity 16:** students investigate and examine networks for hardware.  Students examine their home network and explain with examples what hardware infrastructure it has.  Students examine the school network and explain with examples what hardware infrastructure it has.  **Activity 17:** students summarise what function the following [protocols](https://www.youtube.com/watch?v=znIjk-7ZuqI) (1:59) have:   * HTTP (Hypertext Transfer Protocol) * SMTP (Simple Mail Transfer Protocol) * TCP/IP (Transmission Control Protocol/Internet Protocol).   **Activity 18:** students complete a table, defining the following backup strategies:   * external hard drives * network-attached storage (NAS) * cloud storage * backup software.   **Activity 19:** Notifiable Data Breaches Scheme. In Australia, under the Privacy Act, the Notifiable Data Breaches (NDB) scheme requires organisations to notify individuals and the Office of the Australian Information Commissioner (OAIC) when a data breach occurs that is likely to result in serious harm.  Students research [recent data breaches](https://www.upguard.com/blog/biggest-data-breaches-australia) that have been in the news. | Students watch instructional videos introducing graph and network theory in social network design. They can analyse the impact of these theories on social networking.  Students engage in collaborative reading sessions, exploring the concept of social network analysis as a class.  Students visualise graphs representing social media connections, guided by a data visualisation tutorial.  Students analyse and monitor their web browsing habits over multiple lessons, utilising Firefox Lightbeam analysis tools.  Students engage in research, examining newly developed technologies such as Neuralink and 5G. Subsequently, they craft summaries elucidating the latest frontiers in networking systems.  Students conduct detailed examinations of network hardware, both within their home and school environments. They provide illustrative explanations alongside concrete examples.  Students compile comprehensive definitions for distinct backup strategies, including external hard drives, network-attached storage (NAS), cloud storage and backup software.  Students conduct research on recent data breaches highlighted in the news, aligning with the Notifiable Data Breaches Scheme in Australia, which mandates organisations to notify individuals and authorities in the event of significant data breaches. | This section is also for use in school when making adjustments to support all students to achieve in their learning.  Provide visual and/or multimedia examples and check understanding of concepts.  Prompt student discussion with real-world scenarios and examples.  Include multiple opportunities to respond, for example:   * verbally * individually * partner turn and talk * non-verbally * gesture * response cards. |  |

## Week 3

Table 3 – lesson sequence and details

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Outcomes and content | Teaching and learning activities | Evidence of learning | Differentiation/ adjustments | Registration and evaluation notes |
| **EC-11-04**  **EC-11-06**  **EC-11-07**  **EC-11-09**  Students:   * investigate how the developments in network connectivity and speed have influenced work practices within an enterprise   Including:   * remote working opportunities * file sharing * task delegation and monitoring * examine the benefits and limitations of digital workflows operating in an enterprise * investigate data storage requirements for an enterprise   Including:   * capacity * accessibility * location * security. | **Learning intention**  Understand human-centric computing and storage and workflow in enterprise networks.  **Success criteria**   * I can outline the business and individual cultural characteristics that contribute to the success of start-ups. * I can investigate how the developments in network connectivity and speed have influenced work practices within an enterprise. * I can examine the benefits and limitations of digital workflows operating in an enterprise. * I can investigate data storage requirements for an enterprise.   **Teaching and learning activity**  **Activity 20:** students describe what is meant by a start-up.  **Activity 21:** students read about the [Sydney Startup Hub](https://www.investment.nsw.gov.au/living-working-and-business/sydney-startup-hub/) and outline the business characteristics which contribute to success.  Students read [Thirteen key characteristics of a great startup culture](https://www.bizjournals.com/seattle/blog/techflash/2009/05/Thirteen_characteristics_of_a_great_startup_culture_45678557.html) and outline the individual characteristics which contribute to success.  **Activity 22:** students complete definitions for common file sharing software and concepts:   * Dropbox, Google Drive, OneDrive * Security * Teamwork * Fast Network Speeds.   **Activity 23:** students complete a table including definitions and descriptions for how software is used for task delegation and monitoring impacts on work practices. They examine the following software products:   * Asana * Trello * Slack * Microsoft Teams * Microsoft Remote Desktop.   **Activity 24:** students read about [how digital workflows streamline business](https://signaturely.com/digital-workflows/). Students look at the 5 case studies provided on the website to complete the table.   * Wareing buildings – warehouse solutions * Delta Clinic – online medical services * Eurofound – government agency * Outwood Grange Academy – educational organisation * Influence & Co – content marketing agency.   **Activity 25:** scenario – You are an IT manager in charge of the network at a small business with 20 employees in a rural office location. What data storage solutions would you purchase from [Bleuwire](https://bleuwire.com/enterprise-data-storage-101/) when considering capacity, accessibility, location and security? | Students investigate the Sydney Startup Hub and outline its business characteristics.  Students provide definitions for common file-sharing software and related concepts, including Dropbox, Google Drive, OneDrive, security, teamwork and fast network speeds.  Students complete a table, offering definitions and descriptions of how software tools like Asana, Trello, Slack, Microsoft Teams and Microsoft Remote Desktop are used for task delegation and monitoring impacts on work practices.  Students investigate how digital workflows streamline business operations and examine 5 case studies. They use this information to complete a table that includes businesses like Wareing Buildings, Delta Clinic, Eurofound, Outwood Grange Academy, and Influence & Co.  Students step into the role of an IT manager responsible for a network at a small business with 20 employees in a rural office location.  Students consider factors such as capacity, accessibility, location and security when deciding on data storage solutions to purchase from Bleuwire. | This section is also for use in school when making adjustments to support all students to achieve in their learning.  Provide visual and/or multimedia examples and check understanding of concepts.  Prompt student discussion with real-world scenarios and examples.  Include multiple opportunities to respond, for example:   * verbally * individually * partner turn and talk * non-verbally * gesture * response cards. |  |

## Week 4

Table 4 – lesson sequence and details

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Outcomes and content | Teaching and learning activities | Evidence of learning | Differentiation/ adjustments | Registration and evaluation notes |
| **EC-11-01**  **EC-11-03**  **EC-11-06**  **EC-11-10**  Students:   * explore cloud computing services   Including:   * Infrastructure as a Service (IaaS) * Software as a Service (SaaS) * Platform as a Service (PaaS) * compare different types of cloud-based data storage in terms of access and services   Including:   * public cloud * private cloud * hybrid cloud * non-cloud on premises. | **Learning intention**  Understand storage and workflow in enterprise networks.  **Success criteria**   * I can explore cloud computing services. * I can compare different types of cloud-based data storage in terms of access and services.   **Teaching and learning activity**  **Activity 26:** as a class, students watch a video on [Cloud computing (6:23)](https://www.youtube.com/watch?v=M988_fsOSWo) that covers the key points:   * Cloud computing versus on premises * Infrastructure as a Service (IaaS) * Software as a Service (SaaS) * Platform as a Service (PaaS) * Public, private and hybrid cloud.   Students answer the following corresponding questions after watching the video.   * What are the key roadblocks faced by the owner of the small software development firm when trying to scale their business? * How does cloud computing differ from on-premise computing in terms of scalability? * What are the advantages of cloud computing when it comes to server storage compared to on-premise systems? * In terms of data security, why do cloud computing systems have an edge over on-premise systems? * What are the implications of data loss in on-premise setups compared to cloud computing systems? * How does maintenance for on-premises systems differ from maintenance for cloud computing systems? * Can you provide a concise definition of cloud computing based on the video? * What are the 3 deployment models in cloud computing, and how do they compare to different modes of transportation? * Explain the 3 major service models in cloud computing: IaaS, PaaS and SaaS. | Students investigate cloud computing and address key questions to understand cloud computing concepts, deployment models and service models.  Students compare different types of cloud-based data storage in terms of access and services. | This section is also for use in school when making adjustments to support all students to achieve in their learning.  Message abundancy may be useful when introducing new terminology. The word is spoken, written on the board, represented by visuals.  Include multiple opportunities to respond, for example:   * verbally * individually * partner turn and talk * non-verbally * gesture * response cards. |  |

## Week 5

Table 5 – lesson sequence and details

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Outcomes and content | Teaching and learning activities | Evidence of learning | Differentiation/ adjustments | Registration and evaluation notes |
| **EC-11-04**  **EC-11-08**  **EC-11-10**  Students:   * describe key components of an organisation’s information technology infrastructure   Including:   * networking, including servers, storage and end-point devices * on-premises computing * cloud computing * describe how transmission media is used in networks * explain factors that interfere with the transmission of data across a computer and social network   Including:   * distance * topography * physical barriers * environmental barriers * investigate ways to improve data flow within a system, considering proximity and modes of connectivity   Including:   * size, location and power of antennae when using satellite and microwave * traffic filtering * flow scheduling and traffic monitoring on telecommunications, including wireless broadband for mobile devices (3G→), Bluetooth and wi-fi * investigate the application of graph theory and network theory in the design of optimised computer networks   Including:   * adjacency * centrality * connectedness * weighted graphs. | **Learning intention**  Understand network architecture and infrastructure.  **Success criteria**   * I can describe key components of an organisation’s information technology infrastructure. * I can describe how transmission media is used in networks. * I can explain factors that interfere with the transmission of data across a computer and social network. * I can investigate ways to improve data flow within a system, considering proximity and modes of connectivity. * I can investigate the application of graph theory and network theory in the design of optimised computer networks.   **Teaching and learning activity**  **Activity 27:** students read about [7 components of IT infrastructure and how they work together](https://houseofit.ph/blog/7-components-of-it-infrastructure-and-how-they-work-together).  Students describe how their home network makes use of the following components. If they do not use a component they can describe how it could be used at home or in business:   * networking, including servers, storage and end point devices * on-premises computing * cloud computing.   **Activity 28**: students examine their home network and describe how their network makes use of the following components.   * copper wires * fibre optic cable * wireless transmission.   If students do not use a component they can describe how it could be used at home or in business.  **Activity 29:** students examine their home network and describe how they could improve data flow.  They may consider:   * size, location and power of antennae when using satellite and microwave * traffic filtering * flow scheduling and traffic monitoring on telecommunications, including wireless broadband for mobile devices (3G→), Bluetooth and wi-fi.   **Activity 30:** students draw an [adjacency matrix](https://www.youtube.com/watch?v=5S1II7Mc8v8) to show their classroom and school environment.  **Activity 31:** students create a diagram to show the nodes and their weight in their home environment.  Their diagram should demonstrate:   * adjacency * centrality * connectedness * weighted graphs. | Students gain an understanding of infrastructure components and their applications in real-world settings.  Students explore network elements such as copper wires, fibre optic cables and wireless transmission, evaluating how these components can be utilised in both home and business contexts.  Students analyse and suggest enhancements for the data flow in their home networks.  Students develop accurate visual diagrams including adjacency matrixes and diagrams to depict network connections and the significance of nodes within their school and home network setups. | This section is also for use in school when making adjustments to support all students to achieve in their learning.  Provide visual and/or multimedia examples and check understanding of concepts.  Prompt student discussion with real-world scenarios and examples.  Include multiple opportunities to respond, for example:   * verbally * individually * partner turn and talk * non-verbally * gesture * response cards. |  |

## Week 6

Table 6 – identifying and defining lesson sequence and details

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Outcomes and content | Teaching and learning activities | Evidence of learning | Differentiation/ adjustments | Registration and evaluation notes |
| **EC-11-03**  **EC-11-04**  **EC-11-07**  **EC-11-10**  Students:   * explore device interoperability within an Internet of Things (IoT) based enterprise network, including supervisory control and data acquisition (SCADA) * investigate communication protocols between devices in an Internet of Things (IoT) network * explore the benefits of interfacing machine learning (ML) with IoT   Including:   * data-driven optimisation to enable predictive maintenance and logistics in manufacturing * data acquired from medical imaging to improve accuracy of diagnosis * improving traffic control through ML and sensors * automating soil moisture data collection to manage farm irrigation * investigate security measures used to control access to networks   Including:   * password systems * biometric measures * CAPTCHA * trusted Platform Module (TPM) * automatic software updates * examine data security for an intelligent home network   Including:   * access levels, including universal plug and play (UPnP) * passwords and firewalls * port management on routers and switches * wi-fi device positioning * virtual private networks (VPNs) and hidden networks * backup and disaster recovery. | **Learning intention**  Understand network architecture and infrastructure.  **Success criteria**   * I can explore device interoperability within an Internet of Things (IoT) based enterprise network, including supervisory control and data acquisition (SCADA). * I can investigate communication protocols between devices in an Internet of Things (IoT) network. * I can explore the benefits of interfacing machine learning (ML) with IoT. * I can examine data security for an intelligent home network.   **Teaching and learning activity**  **Activity 32:** students examine their home network and describe how the following could be relevant in a table.   * Device Interoperability within an IoT network. * Communication protocols between devices in an IoT network. * Benefits of Interfacing Machine learning in an IOT network.   **Activity 33:** students read about [agriculture use cases for machine learning applications](https://vitalflux.com/agriculture-use-cases-machine-learning-applications/). Students summarise how machine learning can be used for agriculture.  **Activity 34:** students read about [how computer vision can be used to improve crop yield](https://www.analyticsvidhya.com/blog/2023/01/ai-in-agriculture-using-computer-vision-to-improve-crop-yields/)s. Students explain how crop yields are improved with computer vision.  **Activity 35:** as a class, students watch this video on [Why CAPTCHAs are getting harder](https://www.youtube.com/watch?v=lUTvB1O8eEg) (8:03). Students describe how CAPTCHA works.  As a class the teacher goes through the requirements of Assessment task 2.  Students may access networking equipment at school, examine their own home network or that of an investigated enterprise system including a local business or researched organisation. Students who are unable to physically model a network may use software to virtually create their network using a network simulator.  Inspired by the Internet of Things (IoT) students design and model a network of interconnected devices for a specific purpose and create a video to showcase their project.  Students create a video of a network. This video may include footage of components being configured and networked and include visuals such as diagrams and a network simulator to showcase their interconnected devices.  Students follow these steps to create their project:  **Identifying and defining**   * Design and model a network of interconnected devices for a specific purpose. * Choose an environment or location to represent and model a network. * Define the specific purpose of the network. * Examine what IoTs are used in the network.   **Research and planning**   * Apply appropriate project management tools to develop a project by creating a storyboard and script to plan the video. * Use voice narration, titles, relevant graphics, diagrams or videos to describe how systems are used in enterprises and how data is safely and securely collected, stored and manipulated when developing enterprise computing systems. * Use voice narration, titles, relevant graphics, diagrams or videos to explain how innovative technologies have influenced systems and explore the social, ethical and legal implications of the application of enterprise computing systems on the individual, society and the environment.   **Producing and implementing**   * Video record how you configure devices within a network   Including   * naming the device * updating the device * configuring security protocols * connecting to the internet. * Implement procedures and security protocols considering cybersecurity. * Explore opportunities for optimising network performance   Including   * improving bandwidth * updating drivers and firmware.   **Testing and evaluating**   * Evaluate the role of hardware and software related to the transmission of data   Including   * unsecured data * encrypted data * infrastructure. | Students investigate how IoT device compatibility, communication protocols and machine learning benefits relate to their home network.  Students understand the applications of machine learning in agriculture and summarise how this technology can be utilised to benefit the agricultural sector.  Students explore the use of computer vision to enhance crop yield.  Students can explain how computer vision technology is employed to improve crop yield in agriculture.  Students engage with a video discussing why CAPTCHAs are becoming more challenging and describe how CAPTCHA technology functions.  Students commence work on Assessment task 2 and receive ongoing feedback from the teacher. | This section is also for use in school when making adjustments to support all students to achieve in their learning.  Provide visual and/or multimedia examples and check understanding of concepts.  Prompt student discussion with real-world scenarios and examples.  Include multiple opportunities to respond, for example:   * verbally * individually * partner turn and talk * non-verbally * gesture * response cards. |  |

## Weeks 7–9

Table 7 – lesson sequence and details

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Outcomes and content | Teaching and learning activities | Evidence of learning | Differentiation/ adjustments | Registration and evaluation notes |
| **EC-11-08**  **EC-11-09**  **EC-11-10**  **EC-11-11**  Students:   * design and model a network of interconnected devices for a specific purpose * apply appropriate project management tools to develop a project * configure devices within a network   Including   * naming the device * updating the device * configuring security protocols * connecting to the internet * implement procedures and security protocols considering cybersecurity * explore opportunities for optimising network performance   Including:   * improving bandwidth * updating drivers and firmware. | **Learning intention**  Understand how to create a network.  **Success criteria**   * I can design and model a network of interconnected devices for a specific purpose. * I can apply appropriate project management tools to develop a project.   **Teaching and learning activity**  **Activity 36:** scenario – Digital home specialist.  Imagine you are in a new career called a Digital home specialist.  In the space below design the ultimate home network for a client who wants access to the newest, fastest and most innovative technology.  Be sure to include the following in your report:   * diagrams and images * hardware * software * communications technology * security protocols * network transmission media * configure devices within a network * naming the device * updating the device * configuring security protocols * connecting to the internet * explore opportunities for optimising network * improving bandwidth * updating drivers and firmware * implement procedures and security protocols.   **Activity 37:** scenario – building a Raspberry Pi-based network for immersive experiences.  Create a local network using a Raspberry Pi to support immersive experiences such as AR, MR and VR.   * Set up a Raspberry Pi. * Configure network. * Test the network.   **Activity 38:** studentsread current news headlines on recent [data breaches](https://www.webberinsurance.com.au/data-breaches-list#twentythree)and complete the following questions:   * What caused the data breach? * Explain the main reason behind the data breach. * What were the consequences of the breach? * Describe the negative outcomes resulting from the breach. * How did the organisation respond to the breach? * Share the actions taken by the organisation to address the breach. * What can be learnt from this incident? * Summarise the key lessons that can help prevent similar breaches. * What measures have been implemented to prevent future breaches? * Highlight the steps taken to enhance security and avoid future breaches. | Students demonstrate understanding of how to create networks by designing and modelling interconnected devices for specific purposes.  Students apply project management tools effectively to develop network projects and develop Assessment task 2.  Students demonstrate their knowledge by designing the ultimate home network for a client, including diagrams, hardware, software, communication technology, security protocols, and more.  Students demonstrate their skills in configuring devices within a network, including naming, updating and configuring security.  Students explore and identify opportunities for optimising networks, improving bandwidth, updating drivers and firmware, and implementing security protocols.  Students work on Assessment task 2 and receive ongoing feedback from the teacher. | This section is also for use in school when making adjustments to support all students to achieve in their learning.  Include multiple opportunities to respond, for example:   * verbally * individually * partner turn and talk * non-verbally * gesture * response cards. |  |

## Week 10

Table 8 – lesson sequence and details

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Outcomes and content | Teaching and learning activities | Evidence of learning | Differentiation/ adjustments | Registration and evaluation notes |
| **EC-11-02**  **EC-11-04**  **EC-11-09**  Students:   * evaluate the role of hardware and software related to the transmission of data   Including:   * unsecured data * encrypted data * infrastructure. | **Learning intention**  Understand how to create a network.  **Success criteria**   * I can evaluate the role of hardware and software related to the transmission of data.   **Teaching and learning activity**  **Activity 39**: as a class recall examples of [hardware components involved in data transmission](https://in.indeed.com/career-advice/career-development/what-is-network-hardware#:~:text=Questions%20(With%20Answers)-,Router,data%20flow%20within%20a%20network) and discuss how software contributes to the transmission of data.  **Activity 40:** students individually research and answer the following questions:   * What hardware components are essential for data transmission in immersive technologies? * How do sensors, cameras and input devices contribute to data transmission? * What challenges may arise when dealing with hardware-related data transmission issues? * How do software applications and algorithms manage data transmission? * What role does coding and programming play in optimising data transmission? * How do software updates and improvements impact the overall user experience?   Students submit their Assessment task 2 and may showcase their assessment task in class by playing their video and receiving peer feedback. | Students recall hardware components involved in data transmission and discuss how software contributes to transmission of data.  Students demonstrate knowledge and conduct research into essential hardware components for data transmission in immersive technologies.  Students examine the contributions of sensors, cameras and input devices, and address challenges related to hardware-based data transmission issues.  Students identify the causes, consequences and organisational responses to these breaches.  Students submit their work on Assessment task 2 and receive summative feedback from the teacher.  Students may showcase their Assessment task 2 in class by playing their video and receiving peer feedback. | This section is also for use in school when making adjustments to support all students to achieve in their learning.  Include multiple opportunities to respond, for example:   * verbally * individually * partner turn and talk * non-verbally * gesture * response cards. |  |

# Additional information

For additional support or advice, contact the TAS curriculum team by emailing [TAS@det.nsw.edu.au](mailto:TAS@det.nsw.edu.au).

## Further implementation support

Curriculum design and implementation is a dynamic and contextually-specific process. The department is committed to supporting teachers to meet the needs of all students. The advice below on assessment and planning for the needs of every student may be useful when considering the material presented in this sample program of learning.

## Assessment for learning

Possible formative assessment strategies that could be included:

* Learning intentions and success criteria assist educators to articulate the purpose of a learning task to make judgements about the quality of student learning. These help students focus on the task or activity taking place and what they are learning and provide a framework for reflection and feedback. [Online tools](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/622) can assist implementation of this formative assessment strategy.
* Eliciting evidence strategies allow teachers to determine the next steps in learning and assist teachers in evaluating the impact of teaching and learning activities. Strategies that may be added to a learning sequence to elicit evidence include all student response systems, [exit tickets](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/543), mini whiteboards (actual or [digital](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/575)), [hinge questions](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/560), [Kahoot](https://app.education.nsw.gov.au/digital-learning-selector/LearningTool/Card/621), [Socrative](https://app.education.nsw.gov.au/digital-learning-selector/LearningTool/Card/587), or quick quizzes to ensure that individual student progress can be monitored and the lesson sequence adjusted based on formative data collected.
* Feedback is designed to close the gap between current and desired performance by informing teacher and student behaviour (AITSL 2017). AITSL provides a [factsheet to support evidence-based feedback](https://www.aitsl.edu.au/teach/improve-practice/feedback#:~:text=FEEDBACK-,Factsheet,-A%20quick%20guide).
* [Peer feedback](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/549) is a structured process where students evaluate the work of their peers by providing valuable feedback in relation to learning intentions and success criteria. It can be supported by [online tools](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Browser?cache_id=1d29b).
* Self-regulated learning opportunities assist students in taking ownership of their own learning. A variety of strategies can be employed and some examples include reflection tasks, [Think-Pair-Share](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/645), [KWLH charts](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/562), [learning portfolios](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/583) and [learning logs](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/583).

The primary role of assessment is to establish where individuals are in their learning so that teaching can be differentiated and further learning progress can be monitored over time.

Feedback that focuses on improving tasks, processes and student self-regulation is the most effective. Students engaging with feedback can take many forms including formal, informal, formative, summative, interactive, demonstrable, visual, written, verbal and non-verbal (CESE 2020a).

## Differentiation

Differentiated learning can be enabled by differentiating the teaching approach to content, process, product and the learning environment. 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 these resources in the classroom, it is important for teachers to consider the needs of all students in their class, including:

* **Aboriginal and Torres Strait Islander students**. Targeted [strategies](https://education.nsw.gov.au/teaching-and-learning/aec/aboriginal-education-in-nsw-public-schools) can be used to achieve outcomes for Aboriginal students in K-12 and increase knowledge and understanding of Aboriginal histories and cultures. Teachers should utilise students’ Personalised Learning Pathways to support individual student needs and goals.
* **EAL/D learners**. EAL/D learners will require explicit English language support and scaffolding, informed by the [EAL/D enhanced teaching and learning cycle](https://education.nsw.gov.au/teaching-and-learning/curriculum/literacy-and-numeracy/resources-for-schools/eald/enhanced-teaching-and-learning-cycle) and the student’s phase on the [EAL/D Learning Progression](https://education.nsw.gov.au/teaching-and-learning/curriculum/multicultural-education/english-as-an-additional-language-or-dialect/planning-eald-support/english-language-proficiency). In addition, teachers can access information about [supporting EAL/D learners](https://education.nsw.gov.au/teaching-and-learning/curriculum/multicultural-education/english-as-an-additional-language-or-dialect/planning-eald-support/english-language-proficiency) and [literacy and numeracy support specific to EAL/D learners](https://education.nsw.gov.au/teaching-and-learning/curriculum/literacy-and-numeracy/resources-for-schools/eald).
* **Students with additional learning needs**. Learning adjustments enable students with disability and additional learning and support needs to access syllabus outcomes and content on the same basis as their peers. 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. Subject specific curriculum considerations can be found on the [Inclusive Practice hub](https://education.nsw.gov.au/campaigns/inclusive-practice-hub).
* **High potential and gifted learners**. [Assessing and identifying high potential and gifted learners](https://education.nsw.gov.au/teaching-and-learning/high-potential-and-gifted-education/supporting-educators/assess-and-identify#Assessment1) will help teachers decide which students may benefit from extension and additional challenge. [Effective strategies and contributors to achievement](https://education.nsw.gov.au/teaching-and-learning/high-potential-and-gifted-education/supporting-educators/evaluate) for high potential and gifted learners help teachers to identify and target areas for growth and improvement. In addition, the [Differentiation Adjustment Tool](https://education.nsw.gov.au/teaching-and-learning/high-potential-and-gifted-education/supporting-educators/implement/differentiation-adjustment-strategies) can be used to support the specific learning needs of high potential and gifted students. The [High Potential and Gifted Education Professional Learning and Resource Hub](https://schoolsnsw.sharepoint.com/sites/HPGEHub/SitePages/Home.aspx) supports school leaders and teachers to effectively implement the High Potential and Gifted Education Policy in their unique contexts.

All students need to be challenged and engaged to develop their potential fully. A culture of high expectations needs to be supported by strategies that both challenge and support student learning needs, such as through appropriate curriculum differentiation(CESE 2020a:6).

## 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](mailto: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/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) 3.2.2, 3.3.2.

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

**NSW syllabus**: Enterprise Computing 11–12

**Syllabus outcomes**: EC-11-01, EC-11-02, EC-11-03, EC-11-04, EC-11-05, EC-11-06, EC-11-07, EC-11-08, EC-11-09, EC-11-10,

EC-11-11.

**Author**: TAS, Curriculum Secondary Learners, Curriculum Reform

**Publisher**: State of NSW, Department of Education

**Resource**: Program of learning

**Related resources**: further resources to support Enterprise Computing 11–12 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 [HSC Professional Learning](https://education.nsw.gov.au/teaching-and-learning/professional-learning/hsc-pl) or on the [TAS curriculum page](https://education.nsw.gov.au/teaching-and-learning/curriculum/tas).

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# Evidence base

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# References

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