Enterprise Computing Stage 6 (Year 12) – sample program of learning

Data visualisation

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# About this resource

## Purpose of resource

The resource is a sample program of learning for teaching data visualisation in Year 12 during the Enterprise Computing 11–12 course.

## Target audience

This resource can be used by teachers to support effective syllabus implementation of Enterprise Computing 11–12.

## When and how to use

This resource is designed for implementing over 10 weeks or for a term of learning on data visualisation. The resource can be adapted and contextualised to the school setting. Adjustments can be made to the program of learning to suit students in the teaching and learning cycle.

# 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 or 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 that students will develop a fundamental understanding of the principles and practices of data visualisation. The lessons and sequences are designed to equip students with the knowledge and skills needed to collect, analyse, and present data using various visualisation techniques. Throughout the unit, students will explore how data visualisations can effectively communicate insights and support decision-making processes.

Weeks 1 to 5 will focus on using data to tell a compelling story. Students will learn to transform raw data into meaningful visualisations that highlight key messages. They will explore the importance of user interfaces (UI) and user experience (UX) in designing visualisations that are accessible, clear, and engaging. This will extend their understanding of how data can be translated into information that influences audience perception and comprehension.

Weeks 6 to 10 will involve more advanced data analysis and interrogation techniques, where students will create visualisations that inform decisions. During this time, they will delve into methods for evaluating data bias and ensuring the accuracy of insights. Students will also reflect on the impact of their visualisations on decision-making and explore how data-driven conclusions can lead to improved outcomes.

The unit will culminate in an Assessment task where students will use spreadsheets, databases, data analysis, modelling and simulation software to create data visualisations. They will be required to present and communicate a ‘data story’ that showcases their ability to analyse and visualise data effectively. Additionally, students will be encouraged to integrate their skills in data visualisation into their Enterprise Computing project, identifying real-world applications and opportunities for deeper exploration.

**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:

* explains how systems meet the needs of a range of enterprises **EC-12-01**
* explains the function of data and information within enterprise computing systems **EC-12-02**
* explains and evaluates how data is safely and securely collected, stored and manipulated when developing enterprise computing systems **EC-12-03**
* explains how data is used in enterprise computing systems **EC-12-04**
* applies tools and resources to analyse complex datasets **EC-12-05**
* analyses how innovative technologies have influenced enterprise computing systems **EC-12-06**
* explains the social, ethical and legal implications of the application of enterprise computing systems on the individual, society and the environment **EC-12-07**
* justifies the selection and use of tools and resources to design and develop an enterprise computing system **EC-12-08**
* evaluates the effectiveness of an enterprise computing system **EC-12-10**
* communicates an enterprise computing solution to a specific audience **EC-12-11**

[Enterprise Computing 11–12 Syllabus](https://curriculum.nsw.edu.au/syllabuses/enterprise-computing-11-12-2022) © 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 and adjustments | Registration and evaluation notes |
| **Outcomes**  **EC-12-01**  **EC-12-04**  **Content**  Students explain the purposes of data visualisation, including:   * simplifying **understanding** * **telling a story** * **highlighting** significant results. | **Learning intention**  Understand how data visualisation is used to communicate information and tell data-driven stories effectively.  **Success criteria**   * I can describe how visualisation simplifies complex datasets for better understanding. * I can identify key reasons for using data visualisation in enterprise systems. * I can explain the purpose of data visualisation. * I can explain how data visualisations highlight significant trends and insights.   **Teaching and learning activities**  Introduce the topic of Data visualisation, specifically understanding the subtopics:   * Using data to tell a story * Interpreting data visualisations * Designing for user experience * Creating data visualisations.   As a class watch [Enterprise Computing Year 12 Unit 2: Data Visualisation (23:58)](https://www.youtube.com/watch?v=g4biYeAfkmU).  Explain the intent of activities and the key glossary terms for the unit, as well as reminding students of the NESA glossary of words that pertain to the unit.  Discuss how data visualisation is the graphical representation of data to produce easily interpreted information.  Examine how visualising data has been around for a very long time.  Discuss the Assessment task that students will complete towards the end of the term.  As a class, watch [Mapping data visualisations meteoric rise from Victorian London to today (6:00)](https://aeon.co/videos/mapping-data-visualisations-meteoric-rise-from-victorian-london-to-today).  **Activity 1:** visualisation simplifies complex datasets for better understanding and their use in enterprise systems.  As a class, look at [Visualization as Argument, William Playfair’s Time-Series Charts](https://dataxdesign.io/chapters/playfair) and discuss the value of data visualisation.  Students describe how visualisation simplifies complex datasets for better understanding.  Students identify key reasons for using data visualisation in enterprise systems.  As a class watch [Data Visualization in 2024 | The Ultimate Guide (11:01)](https://www.youtube.com/watch?v=loYuxWSsLNc) and discuss the purposes of data visualisation.  **Activity 2:** data visualisation uses and purpose.  Students describe data visualisation they use on a regular basis.  Students explain the purpose of data visualisation.  Teacher-led discussion on the purposes of data visualisation including simplifying understanding, telling a story and highlighting significant results.  **Activity 3:** the best data visualisation.  As a class read and investigate the [10 Of The Best Data Visualization Examples From History & Today](https://www.tableau.com/learn/articles/best-beautiful-data-visualization-examples).  Students [Think, Pair, Share](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/645) in a small groups about what in their opinion, is the best data visualisation they have seen.  Students look at the data of Napoleon’s 1812 march on Russia.  As a class watch [Minard's Famous "Napoleon's March" Chart – What It Shows, What It Doesn't (11:23)](https://www.youtube.com/watch?v=hlb1uM_SOcE).  Students answer questions on Minard’s data visualisation.  **Activity 4:** favourite topping on Superbowl pizza state by state.  Students explore trends in pizza toppings using the article [Super Bowl pizza sales reach into the millions](https://www.usatoday.com/in-depth/graphics/2023/02/09/national-pizza-day-super-bowl-favorite-toppings-graphics/11201105002/) as a source of information. They analyse how the data is presented in the article. | Students will be able to describe how data visualisation simplifies complex datasets for better understanding.  Through classroom discussions and the viewing of videos, students will engage with the concept of using graphical representations of data to convey complex information more clearly.  By examining examples such as historical data visualisations and modern enterprise systems, students will be able to articulate how visualisation reduces the cognitive load involved in interpreting data.  Students will identify key reasons for using data visualisation in enterprise systems. After watching and discussing relevant videos, students will gain an understanding of how businesses and organisations utilise visualisations to make data-driven decisions. They will be able to explain how visualisation tools streamline communication, reveal patterns, and support strategic planning in enterprise environments.  Students will explain the purpose of data visualisation. By participating in activities such as reviewing real-world visualisations and discussing their role, students will be able to describe how visualisation serves multiple purposes: simplifying complex information, telling data-driven stories, and highlighting significant trends and insights. They will also explore how effective visualisation can influence decision-making in various fields.  Students will explain how data visualisations highlight significant trends and insights. In small group discussions and analysis of famous visualisations like Napoleon’s 1812 march on Russia, students will learn to recognise how data visualisations emphasise key data points, historical events, or outcomes. Through collaborative work, they will practice identifying the most impactful visualisations and justifying their choices.  Students will develop skills in creating their own data visualisations. Through teacher-led instruction and hands-on activities, students will begin designing visualisations with user experience in mind, incorporating best practices to ensure clarity and effectiveness. This will prepare them for completing the assessment task at the end of the term, where they will apply what they have learned to produce data visualisations of their own. | Suggested adjusted activities. This section is also for use in school when making adjustments to support all students to achieve in their learning.  Teach key vocabulary and concepts prior to viewing videos, provide a transcript, and use closed captions when viewing.  Students may complete a [Think, Pair, Share](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Card/645) activity to encourage conversation.  Ensure all students understand both technical and culturally based terms.  Include multiple opportunities to respond and discuss, for example:  **Verbally**   * individually * partner turn and talk.   **Non-verbally**   * gesture * response cards.   **Extension activity**  Students create a data visualisation of Australian pizza preferences using data that tells a story. |  |
| **Outcomes**  **EC-12-05**  **EC-12-08**  **Content**  Students describe how features of software contribute to a better understanding of datasets through data visualisation, including spreadsheets, creative design applications and combining applications to track trends and forecast. | **Learning intention**  Explore how different software tools support data visualisation and aid in interpreting datasets.  **Success criteria**   * I can describe the key features of spreadsheets and design applications used for data visualisation. * I can explain how software can be combined to create more effective data visualisations. * I can apply software tools to interpret trends and patterns in datasets. * I can demonstrate how features like charts, graphs, and dashboards aid in data storytelling.   **Teaching and learning activities**  Teacher-led discussion on how the features of software contribute to a better understanding of datasets through data visualisation, including spreadsheets, creative design applications and combining applications to track trends and forecast.  Students look at the [Surfline](https://www.surfline.com/) charts and data visualisations and specifically the composition of applications used to create it.  **Activity 5:** key features and combing applications.  Students answer questions to summarise their understanding. | Students will be able to describe the key features of spreadsheets and design applications used in data visualisation. Through teacher-led discussions and practical activities, students will explore how spreadsheets like Microsoft Excel and creative design applications such as Adobe Illustrator or Tableau enhance data interpretation. They will identify features like charts, conditional formatting, and trendlines in spreadsheets, as well as customisation and interactivity in design applications, which make data more accessible and engaging.  Students will demonstrate how features like charts, graphs, and dashboards aid in data storytelling. After creating their own visualisations, students will be able to explain how these visual elements simplify complex datasets and make it easier for audiences to grasp key trends and insights. They will present their work, showcasing how visualisation techniques improve communication and decision-making in various contexts. | Suggested adjusted activities. This section is also for use in school when making adjustments to support all students to achieve in their learning.  In creating or selecting scenarios, consider students’ own experiences and use of visuals.  Ensure all students understand both technical and culturally-based terms.  Include multiple opportunities to respond and discuss, 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 and adjustments | Registration and evaluation notes |
| **Outcomes**  **EC-12-02**  **EC-12-05**  **Content**  Students identify patterns in data by interpreting and comparing datasets for an enterprise, social or ethical issue to highlight trends and for predictive data analytics. | **Learning intention**  Develop skills to identify patterns in data to explore social or ethical issues in enterprise computing.  **Success criteria**   * I can use data to identify patterns related to a specific social or ethical issue. * I can compare datasets to explore trends and relationships. * I can reflect on how the identified patterns impact enterprises and society.   **Teaching and learning activities**  Teacher-led discussion on identifying patterns in data by interpreting and comparing datasets for an enterprise, social or ethical issue to highlight trends and for predictive data analytics.  As a class discuss the steps that can be taken to identify patterns in data.   1. Collect data 2. Clean and organise data 3. Explore the data 4. Compare datasets 5. Use predictive analytics.   **Activity 6:** examining trends in car colours using data visualisation.  As a class read the article [New Car Colours More Monochrome Than Ever Before, Data Shows](https://www.abc.net.au/news/2024-10-10/new-car-colours-more-monochrome-than-ever-before-data-shows/104451484) as a source of information.  Analyse data presented in the article, practise interpreting trends through data visualisation techniques and answer questions. | Students will develop the ability to use data to identify patterns related to specific social or ethical issues. Through class discussions and activities, students will learn to collect, clean, and organise data relevant to an issue, such as car colour trends, to identify meaningful patterns. By examining these patterns, students will practise using data to highlight significant social or ethical implications within enterprise computing, such as consumer preferences and their broader social impact.  Students will compare datasets to explore trends and relationships. As part of the learning process, students will engage in activities that require comparing multiple datasets to discover correlations or trends.  Students will reflect on how the identified patterns impact enterprises and society. They will also consider how such patterns reflect or affect broader societal trends, such as sustainability concerns or changing cultural preferences, developing a deeper understanding of the ethical implications of data trends.  Students will be able to apply predictive data analytics to forecast future trends based on identified patterns. By practising predictive analytics techniques in class activities, students will make predictions about future consumer preferences or societal shifts, reinforcing their ability to use data to anticipate challenges and opportunities within enterprises. This will also encourage them to think critically about how data trends shape the future of industries and society. | Suggested adjusted activities. This section is also for use in school when making adjustments to support all students to achieve in their learning.  In creating or selecting scenarios, consider students’ own experiences and use of visuals.  Ensure all students understand both technical and culturally-based terms.  Include multiple opportunities to respond and discuss, for example:  **Verbally**   * individually * partner turn and talk.   **Non-verbally**   * gesture * response cards.   **Extension activity**  Students use software like Google Sheets, Microsoft Excel or any data visualisation tool to create their own visualisations based on the trends described in the article. Students create at least one bar chart and one pie chart, then share their visualisations. |  |
| **Outcomes**  **EC-12-06**  **Content**  Students investigate the impact of the evolution of hardware and software on the field of data analytics, including:   * **processing power** * **storage/memory** * **communication media.** | **Learning intention**  Investigate how advancements in hardware and software have transformed data analytics in enterprises.  **Success criteria**   * I can explain the relationship between increased processing power and data analysis capabilities. * I can analyse how storage advancements have influenced data storage and retrieval in enterprises. * I can discuss the role of cloud computing in expanding data analytics possibilities. * I can evaluate how the evolution of technology has influenced trends in enterprise computing.   **Teaching and learning activities**  Teacher-led discussion on the impact of the evolution of hardware and software on the field of data analytics.  **Activity 7:** analysing the impact of evolving hardware and software in sports.  As a class watch [Socceroos World Cup Performance and Data Analysis (1:38–39:50)](https://schoolsnsw.sharepoint.com/sites/TASNSWStatewideStaffroom/_layouts/15/stream.aspx?id=%2Fsites%2FTASNSWStatewideStaffroom%2FShared%20Documents%2F02%2E%20TAS%20professional%20learning%2FAnalysing%20Data%20with%20the%20Socceroos%2FSocceroos%20World%20Cup%20Performance%20and%20Data%20Analysis%20%2Emp4&referrer=StreamWebApp%2EWeb&referrerScenario=AddressBarCopied%2Eview%2E01b06464%2D4597%2D46ee%2D8f5b%2D9fe894226650).  **Scenario**  You are a data analyst working for an Australian soccer organisation that tracks the performance of players across different leagues and levels. Over the past decade, the organisation has upgraded its hardware and software infrastructure to enhance its data analytics capabilities. These upgrades include more powerful processing systems, increased storage for player data, and improved communication tools for real-time analysis and collaboration.  In small groups, students discuss questions and assess how these technological advancements have improved the organisation’s ability to analyse player performance data and predict future trends in soccer. | Students will be able to explain the relationship between increased processing power and data analysis capabilities. Through a teacher-led discussion on the evolution of hardware and software, students will explore how advancements in processing power have enabled more complex data analytics.  Students will analyse how storage advancements have influenced data storage and retrieval in enterprises. In small group discussions, students will examine the scenario of an Australian soccer organisation upgrading its infrastructure, highlighting how increased storage capacity allows for the collection and long-term storage of large datasets. This includes vast amounts of player performance data, which can be retrieved and analysed to track trends over time. Students will explore how these advancements support more comprehensive and accurate data-driven decisions in enterprises.  Students discuss the role of cloud computing in expanding data analytics possibilities. In the scenario, students assess how cloud-based systems allow data analysts to access and share data across different locations, facilitating real-time collaboration and analysis, which enhances the organisation’s ability to predict performance trends and make informed decisions.  Students will evaluate how the evolution of technology has influenced trends in enterprise computing. | Suggested adjusted activities. This section is also for use in school when making adjustments to support all students to achieve in their learning.  In creating or selecting scenarios, consider students’ own experiences and use of visuals.  Ensure all students understand both technical and culturally-based terms.  Include multiple opportunities to respond and discuss, for example:  **Verbally**   * individually * partner turn and talk.   **Non-verbally**   * gesture * response cards. |  |
| **Outcomes**  **EC-12-04**  **EC-12-05**  **Content**  Students describe online analytical processing (OLAP). | **Learning intention**  Understand how OLAP enables the analysis of large datasets in enterprise environments.  **Success criteria**   * I can define OLAP and its core functions in enterprise data analysis. * I can explain how OLAP allows users to drill down, slice, and dice data. * I can apply OLAP techniques to a real dataset to uncover trends or insights. * I can evaluate the advantages of OLAP over traditional data processing methods.   **Teaching and learning activities**  Teacher-led discussion on OLAP and the OLAP cube including how it allows users to perform complex calculations, such as roll-ups, drill-downs and slicing and dicing, on large, multi- dimensional datasets.  As a class watch [OLAP Cubes: Unleashing Multi-Dimensional Data Insights (7:47)](https://www.youtube.com/watch?v=s8UDqSRXgbg).  **Activity 8:** building an OLAP cube.  In small groups, students imagine that they are building an OLAP cube to analyse sales data for a retail company. Each group will choose 3 dimensions (for example time, geography, product) and build a cube-like structure to organise the data.  **Activity 9:** OLAP reflection questions.  Students answer the following questions:   * How does OLAP allow businesses to make more informed decisions? * Why is multi-dimensional data analysis important in business? | Students will be able to define OLAP and its core functions in enterprise data analysis. Through teacher-led discussions and class activities, students will explore the concept of OLAP (online analytical processing) and its role in managing and analysing large datasets.  Students will explain how OLAP allows users to drill down, slice, and dice data. By participating in class discussions and watching videos on OLAP cubes, students will learn how these functions enable users to explore data at different levels of detail. They will gain a clear understanding of how slicing isolates a subset of data, dicing analyses multiple dimensions, and drilling down focuses on more granular data within a particular dimension.  Students will apply OLAP techniques to a real dataset to uncover trends or insights. In group activities where students simulate building an OLAP cube for retail sales data, they will apply techniques like roll-ups, slicing, and dicing to analyse trends. These activities will help them practise using OLAP to organise and interpret large, multi-dimensional datasets.  Students will evaluate the advantages of OLAP over traditional data processing methods.  Through reflection questions and group discussions, students will critically assess how OLAP’s multi-dimensional approach provides faster, more flexible analysis compared to traditional data processing techniques. | Suggested adjusted activities. This section is also for use in school when making adjustments to support all students to achieve in their learning.  Review key concepts and vocabulary before viewing video. Use closed captions and provide the transcript. Pause video to assess student understanding at appropriate points. |  |

## Week 3

Table 3 – lesson sequence and details

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Outcomes and content | Teaching and learning activities | Evidence of learning | Differentiation and adjustments | Registration and evaluation notes |
| **Outcomes**  **EC-12-03**  **EC-12-04**  **Content**  Students assess data integrity in the development of a data visualisation, including:   * **ownership** * **source** * **validation** * **risk.** | **Learning intention**  Evaluate the importance of data integrity in the creation of accurate and reliable data visualisations.  **Success criteria**   * I can explain the role of data ownership, source, validation and risk in ensuring data integrity. * I can identify risks related to data bias or inaccuracies when developing a data visualisation. * I can assess how the accuracy of data impacts the reliability of insights derived from visualisations. * I can implement strategies to improve data integrity in visualisation projects.   **Teaching and learning activities**  Teacher-led discussion onassessing data integrity in the development of a data visualisation, including:   * ownership * source * validation * risk.   **Activity 10:** assess a dataset.   1. **Choose a dataset**   Students select a dataset to analyse. They could use the dataset for Assessment task 2 or the scenario of school attendance or a dataset from an online source (for example a public government dataset).   1. **Analyse the data integrity**   For each of the 4 categories (ownership, source, validation and risk), students answer questions to assess the integrity of the data.  **Step 1: Ownership**   * Who owns the data? * Who is responsible for collecting and maintaining the data? Is it an individual, a team or an organisation? * Who is responsible for ensuring the data’s accuracy and quality? * Does the data owner verify the data’s accuracy before sharing or visualising it? * Who can make changes or corrections to the data? * If you find errors in the data, who has the authority to fix them?   **Step 2: Source**   * Where does the data come from? * What is the origin of the data? (for example, sensor readings, surveys, manually entered data) * What format is the data in? * Is it a CSV file, database or other format? How was the data processed and cleaned before being stored? * How was the data collected? * Was the data collected automatically or manually? Are there any known limitations in the collection process?   **Step 3: Validation**   * Has the data been validated for accuracy? * Were any checks performed to ensure the data is accurate and complete? * Are there any anomalies or outliers in the data? * Are there any values that don’t make sense or fall outside the expected range? * Are there any missing data points? * Is any data missing or incomplete?   **Step 4: Risk**   * What are the potential risks of using this data? * Could there be privacy concerns, data breaches, or unauthorised access to the data? * Is there a risk of data corruption or loss? * How is the data protected from accidental loss or corruption? * What steps can be taken to mitigate these risks? * What measures should be in place to protect the data? | Students will be able to explain the role of data ownership, source, validation, and risk in ensuring data integrity. Through teacher-led discussions and class activities, students will explore how each of these elements contributes to the trustworthiness and reliability of data used in visualisations. They will learn to articulate how accountability (ownership), credibility (source), accuracy (validation), and security (risk) collectively ensure that the data is accurate and reliable before being visualised.  Students will identify risks related to data bias or inaccuracies when developing a data visualisation. By examining a chosen dataset, students will practise identifying potential biases or inaccuracies that could arise from issues like incomplete data collection or inadequate validation. They will be able to recognise how these risks can skew results and lead to misleading visualisations, impacting the quality of insights derived.  Students will assess how the accuracy of data impacts the reliability of insights derived from visualisations. During the analysis activity, students will reflect on how even minor inaccuracies in a dataset can compromise the conclusions drawn from a visualisation. By evaluating the integrity of their chosen dataset, students will understand the importance of accurate data in maintaining the reliability of visual insights and decision-making processes.  Students will implement strategies to improve data integrity in visualisation projects. After examining their dataset across ownership, source, validation, and risk, students will develop practical strategies to enhance data integrity in their visualisation projects. This may include setting up processes for verifying data ownership, ensuring proper validation checks, and implementing risk mitigation measures to protect data quality and security. Through this, students will gain the skills to create visualisations that are both accurate and reliable. | Suggested adjusted activities. This section is also for use in school when making adjustments to support all students to achieve in their learning.  Review key concepts and vocabulary before viewing video. Use closed captions and provide the transcript. Pause video to assess student understanding at appropriate points. |  |
| **Outcomes**  **EC-12-04**  **EC-12-06**  **Content**  Students explain the impact of enterprise data warehousing on data visualisation, including:   * **analysis and use of historical data trends and patterns** * **correlation with current data** * **data refinement/ optimisation.** | **Learning intention**  Explore how enterprise data warehousing enhances data visualisation capabilities by organising large datasets.  **Success criteria**   * I can define data warehousing and its role in enterprise data management. * I can explain how data warehouses support the creation of accurate and comprehensive visualisations.   **Teaching and learning activities**  As a class watch [What Is a Data Warehouse? (3:31)](https://www.youtube.com/watch?v=AHR_7jFCMeY).  Teacher-led discussion on the impact of enterprise data warehousing on data visualisation, including:   * **analysis and use of historical data trends and patterns** * **correlation with current data** * **data refinement/optimisation.**   **Activity 11:** enterprise data warehouse questions.  Students read [Enterprise Data Warehouse: EDW Components, Key Concepts, and Architecture Types](https://www.altexsoft.com/blog/enterprise-data-warehouse-concepts/).  Students define data warehousing and its role in enterprise data management.  Students explain how data warehouses support the creation of accurate and comprehensive visualisations. | Students will be able to define data warehousing and its role in enterprise data management. Through classroom activities and discussions, students will explore the concept of data warehousing, understanding how it centralises and organises large volumes of data from various sources.  Students will be able to describe the function of a data warehouse in consolidating and preparing data for analysis, which is essential for enterprise decision-making and reporting.  Students will explain how data warehouses support the creation of accurate and comprehensive visualisations. By watching videos and engaging in guided discussions, students will understand how a well-structured data warehouse ensures data consistency and accuracy. They will explore how data warehouses enable businesses to generate precise visualisations by allowing users to analyse historical data, correlate it with current data, and optimise datasets for better insights. This ensures that the visualisations derived from warehouse data are reliable and comprehensive.  Students will analyse the impact of enterprise data warehousing on the visualisation of large datasets. By answering questions and reflecting on the use of data warehouses in an enterprise setting, students will explain how organising and refining data through a data warehouse enhances the ability to track trends and patterns over time. | Suggested adjusted activities. This section is also for use in school when making adjustments to support all students to achieve in their learning.  Review key concepts and vocabulary before viewing video. Use closed captions and provide the transcript. Pause video to assess student understanding at appropriate points. |  |
| **Outcomes**  **EC-12-04**  **EC-12-05**  **Content**  Students explain how big data affects the design and development of data visualisation, including:   * **scope of visible information** * **types and depth of insight provided by the data.** | **Learning intention**  Understand the challenges and opportunities that big data presents for data visualisation design.  **Success criteria**   * I can define big data and its characteristics (volume, variety, velocity). * I can explain how big data influences the choice of visualisation techniques and tools. * I can identify challenges in visualising large datasets, such as processing speed or readability. * I can provide examples of visualisations that effectively handle big data.   **Teaching and learning activities**  Teacher-led discussion on handling large volumes of data, dealing with high velocity data and handling data variety.  Teacher-led discussion on the scope of visible information and types and depth of insight provided by data including:   * increased complexity * more granular insights * improved predictive analytics * increased speed of insights.   **Activity12:** investigate the Transport for NSW Open Data website.  The [Transport for NSW Open Data](https://opendata.transport.nsw.gov.au/dataset/) website contains large datasets of information. Students investigate some of the 200 available datasets and list potential datasets that could inspire the data story in Assessment task 2.  Students imagine they work for the Government in Transport NSW. Students explain how big data affects the design and development of data visualisation for Transport NSW. | Students will be able to define big data and its characteristics (volume, variety, velocity). Through teacher-led discussions and activities, students will explore the concept of big data and its defining features. They will learn that big data involves large volumes of information, encompasses a wide variety of data types, and often requires real-time or near-real-time processing due to high velocity.  Students will explain how big data influences the choice of visualisation techniques and tools. By examining the complexities of big data, students will understand why certain visualisation techniques, such as dashboards, heat maps, or real-time graphs, are necessary for effectively presenting large datasets. They will learn how the characteristics of big data require scalable tools and flexible techniques that allow for clearer analysis and interpretation.  Students will identify challenges in visualising large datasets, such as processing speed or readability. During class discussions and activities, students will explore the technical and design challenges that arise when handling big data.  Students will provide examples of visualisations that effectively handle big data. By investigating datasets on the Transport for NSW Open Data website, students will find examples of visualisations that manage large volumes, varied data types, and real-time updates. Through this activity, students will gain a deeper understanding of how to design effective visualisations that cater to big data contexts. | Suggested adjusted activities. This section is also for use in school when making adjustments to support all students to achieve in their learning.  Review key concepts and vocabulary before viewing video. Use closed captions and provide the transcript. Pause video to assess student understanding at appropriate points. |  |

## Week 4

Table 4 – lesson sequence and details

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Outcomes and content | Teaching and learning activities | Evidence of learning | Differentiation and adjustments | Registration and evaluation notes |
| **Outcomes**  **EC-12-03**  **EC-12-07**  **Content**  Students evaluate bias in data collection, storage and analysis when developing visualisations, including:   * **accuracy** * **audience** * **data source** * **unconscious bias.** | **Learning intention**  Evaluate how bias can impact the collection, storage, and analysis of data and its effect on visualisations.  **Success criteria**   * I can identify common sources of bias in data collection and storage. * I can analyse the impact of bias on data interpretation and visualisations. * I can propose methods to minimise bias in developing data visualisations. * I can reflect on the ethical implications of biased data in enterprise decision-making.   **Teaching and learning activities**  **Teacher-led discussion on how** evaluating bias in data collection, storage, and analysis is crucial when developing visualisations because bias can significantly distort the accuracy and fairness of the insights presented.  **Activity 13:** bias in accuracy, audience, data source and unconscious bias.  Students complete the tables to show the impact on bias in data collection, storage and analysis when developing visualisations.  The tables feature themes of accuracy, audience, data source and unconscious bias.  **Activity 14:** propose methods to minimise bias in developing data visualisations.  Students describe methods that would minimise bias in developing data visualisations. | Students will be able to identify common sources of bias in data collection and storage. Through teacher-led discussions, students will explore how biases can arise from various factors such as data sampling methods, question phrasing, or manual data entry errors. They will learn to recognise sources like selection bias, confirmation bias, and cultural biases in how data is collected and stored and understand their implications for the integrity of datasets.  Students will analyse the impact of bias on data interpretation and visualisations. By completing tables that explore themes such as accuracy, audience, data source, and unconscious bias, students will evaluate how biased data can distort visualisations. They will understand that biases can lead to misrepresentation, overgeneralisation, or misleading conclusions, impacting decision-making processes in enterprises.  Students will propose methods to minimise bias in developing data visualisations. Through classroom activities, students will brainstorm and document strategies to reduce bias, such as diversifying data sources, using standardised collection methods, employing unbiased language, and implementing regular data validation checks. These approaches will help students understand how to create fairer and more accurate visualisations. | Suggested adjusted activities. This section is also for use in school when making adjustments to support all students to achieve in their learning.  In creating or selecting scenarios, consider students’ own experiences and use of visuals.  Ensure all students understand both technical and culturally based terms.  Include multiple opportunities to respond and discuss, for example:  **Verbally**   * individually * partner turn and talk.   **Non-Verbally**   * gesture * response cards. |  |
| **Outcomes**  **EC-12-05**  **EC-12-10**  **Content**  Students evaluate the effectiveness of software tools used to develop data visualisations, including:   * **spreadsheets used to develop dashboards** * **presentation software used to present data analysis** * **business analytics services, including ‘as a service’ products** * **custom software solutions.** | **Learning intention**  Evaluate the strengths and limitations of various software tools used to create data visualisations.  **Success criteria**   * I can compare the features of different data visualisation software tools. * I can analyse how different tools handle complex datasets.   **Teaching and learning activities**  Teacher introduces the subtopic Interpreting data visualisations.  As a class view the Data visualisation PowerPoint.  Teacher-led discussion on several software tools allow users to create data visualisations.  As a class watch [Using Design Techniques for Clear and Appealing Data Visualization (4:16).](https://www.youtube.com/watch?v=0Smgm2UTUSo)  **Activity 15:** reading a graph.  Students analyse a graph and write a reflection on what they think the graph is communicating to them.  As a class watch [Data Analytics – The 9 Essential Tools! 2024 (4:07)](https://www.youtube.com/watch?v=jgXp1EE4Wms) and discuss the tools available to students to use in Assessment task 2.  Class discussion on key factors to consider when evaluating data visualisation tools including:   * ease of use * data integration * customisation * interactivity * cost.   **Activity 16:** evaluate data visualisation software tools.  Students complete a table choosing 3 software tools available to them and evaluating these including describing the benefits of using these tools.  Teacher-led discussion on spreadsheets used to develop dashboards.  Teacher-led discussion on presentation software used to present data analysis  Teacher-led discussion on business analytics services, including ‘as a service’ products.  As a class watch [Software as a Service (SaaS) Explained in 5 mins (5:22)](https://www.youtube.com/watch?v=20QUNgFIrK0).  Discuss advantages of ‘as a service’ products, including:   * scalability * lower costs * automatic updates * accessibility.   Teacher-led discussion on the benefits of custom software solutions, including:   * tailored functionality * scalability * competitive advantage * integration. | Students will be able to compare the features of different data visualisation software tools. Through teacher-led discussions and class activities, students will explore various tools such as Excel, Power BI, Tableau, and Google Data Studio. They will compare features like ease of use, interactivity, customisation options and cost. By completing evaluation tables, students will gain a clearer understanding of how these tools differ and which features are most suited for different types of visualisation tasks.  Students will analyse how different tools handle complex datasets. After watching instructional videos and discussing the role of data analytics tools, students will evaluate the capacity of software tools to manage and visualise large or multi-dimensional datasets. They will consider factors such as data integration capabilities, scalability, and real-time processing. This analysis will enable students to make informed decisions when selecting software for their projects based on their ability to handle complex data effectively.  Students will understand the advantages of ‘as a service’ products and custom software solutions. Through discussions on SaaS and custom solutions, students will explore the benefits of cloud-based tools in terms of scalability, cost-effectiveness, and accessibility. They will also discuss how custom solutions can offer tailored functionality, competitive advantages, and better integration with other systems. This understanding will help students appreciate the variety of visualisation tools available and the different strengths each approach brings to data analysis.  Students will have a comprehensive view of how various software tools can be leveraged to create effective and dynamic data visualisations, enabling them to make strategic choices in Assessment task 2. | Suggested adjusted activities. This section is also for use in school when making adjustments to support all students to achieve in their learning.  In creating or selecting scenarios, consider students’ own experiences and use of visuals.  Ensure all students understand both technical and culturally-based terms.  Include multiple opportunities to respond and discuss, for example:  **Verbally**   * individually * partner turn and talk.   **Non-Verbally**   * gesture * response cards. |  |
| **Outcomes**  **EC-12-04**  **EC-12-05**  **Content**  Students interrogate data from a data visualisation**,** including:   * **interpreting what you see** * **aggregation** * **filtering** * **the effect of outliers** * **reasoning.** | **Learning intention**  Develop skills to interrogate data visualisations and extract meaningful insights from them.  **Success criteria**   * I can apply techniques to filter and analyse data within a visualisation. * I can identify outliers, trends, and patterns in the presented data. * I can use interrogation tools to drill down into specific data points. * I can reflect on how data interrogation improves understanding and decision-making.   **Teaching and learning activities**  **Teacher-led discussion on how to** interrogate data from a data visualisation.  Class discussion on key questions to consider when interrogating a data visualisation including:   * What is the purpose of the visualisation? * What trends, patterns or anomalies are visible? * Are there any outliers or unusual data points? * What assumptions are being made by the visualisation?   **Activity 17:** interrogate data.  As a class watch [How to spot a misleading graph (4:09)](https://www.youtube.com/watch?v=E91bGT9BjYk).  Facilitate a class discussion on how when graphs are used well, they can help us intuitively grasp complex data. While visual software has enabled more usage of graphs throughout all media, it has also made them easier to use in a careless or dishonest way — and as a result, there are plenty of ways graphs can mislead and outright manipulate.  Teacher-led discussion on interpreting what you see.  When interpreting a data visualisation, it is essential to start with the basics:   1. Understand the chart type 2. Examine the axes 3. Look for patterns 4. Contextualise the data.   **As a class discuss aspects of interrogating data including aggregation, filtering, the effect of outliers and reasoning.**  **Activity 18:** Netflix's usage of data visualisation to manage network traffic.  Netflix, a global streaming service, utilises extensive data visualisations to monitor and manage its network traffic across different regions.  Given the diverse geographical locations of its users, Netflix's data visualisations help the company detect and analyse outliers in data traffic, which can indicate potential issues such as server overload, content delivery network (CDN) performance issues or unauthorised access attempts.  **Students answer the case study questions applying the content learned.** | Students will be able to apply techniques to filter and analyse data within a visualisation. Through teacher-led discussions and activities, students will explore how filtering options, such as selecting specific time periods or categories, allow them to focus on key insights within a visualisation. They will practise using these techniques to refine their understanding of the data and reveal hidden trends or correlations.  Students will identify outliers, trends, and patterns in the presented data. By engaging with examples and case studies, such as Netflix’s usage of data visualisation, students will learn to spot anomalies that deviate from typical data points. They will analyse the impact of these outliers on overall trends and discuss how patterns can reveal significant insights about system performance or user behaviour.  Students will use interrogation tools to drill down into specific data points. In classroom activities, students will experiment with tools like interactive dashboards, where they can drill down into detailed data points within a larger visualisation. This will help them understand how focusing on specific data points or regions enhances their analysis and supports more informed conclusions.  Students will reflect on how data interrogation improves understanding and decision-making. Through discussions and reflections on the case studies and activities, students will gain insights into how interrogating data visualisations helps to validate or challenge initial assumptions, clarify the context, and drive better decisions. They will recognise that thoroughly questioning and exploring data visualisations is crucial to extracting meaningful and actionable insights. | Suggested adjusted activities. This section is also for use in school when making adjustments to support all students to achieve in their learning. |  |

## Week 5

Table 5 – lesson sequence and details

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Outcomes and content | Teaching and learning activities | Evidence of learning | Differentiation and adjustments | Registration and evaluation notes |
| **Outcome**  **EC-12-08**  **Content**  Students use graphic design tools to assist in the graphic development of a data visualisation | **Learning intention**  Learn to use graphic design tools to enhance the visual appeal and effectiveness of data visualisations.  **Success criteria**   * I can apply graphic design principles to create clear and engaging visualisations. * I can use design tools to refine charts, graphs and infographics. * I can critically evaluate the aesthetic and functional aspects of a data visualisation.   **Teaching and learning activities**  Teacher-led discussion onhow user experience (UX) design focuses on how a product or service feels to the end user.  Discuss that it involves understanding the needs, values, abilities and limitations of users, as well as the goals and objectives of the product.  When designing for UX, it is crucial to create products that are not only functional but also pleasurable and intuitive to use.  Discuss graphic design tools for data visualisation and selecting the right graphic design tool.  **Activity 19:** build practical skills.  Students choose one of the following software (Canva, Microsoft Excel or Power BI) or research other software and complete tutorials to develop skills to tell a story and apply the principles of UX. This activity leads to the development of skills to create a data story using their chosen data and software for Assessment task 2.  **Canva/Flourish**  As a class watch [Storytelling with Data: Infographics and data visualization | Canva for Journalists (10:04)](https://www.youtube.com/watch?v=SuFcF2uS1zY). Students can complete the activities in the [Charts and graph](https://canva.me/data-workbook-desktop) [workbook](https://canva.me/data-workbook-desktop).  To use advance data visualisation tools in Canva you need to add Flourish to your apps within Canva. To finalise adding Flourish you will need to create a free account with your educational email.  **Excel**  Students may have already mastered the use of Microsoft Excel in earlier learning. The [YouTube playlist of Excel Tutorials by EasyClick Academy](https://www.youtube.com/watch?v=hElkEzAjd5o&list=PLAE-5Y383viiGxNskXM443Ir1mvaSMJqU) has short, accessible tutorials for creating a range of charts and can be referenced as needed.  **Power BI**  As a class watch [From Excel to Power BI in 12 Minutes (Beginner Essentials) (12:42)](https://www.youtube.com/watch?v=gOs7EC-FebE).  How can you find, collect, and clean data from different sources? Power BI is a tool for making sense of your data. Completing the Microsoft learning course [Get data with Power BI Desktop (1 hr 15 min)](https://learn.microsoft.com/en-gb/training/modules/get-data-power-bi/) you will learn tricks to make data-gathering easier. | Students will be able to apply graphic design principles to create clear and engaging visualisations. Through class discussions and tutorials, students will explore key design principles such as balance, contrast, hierarchy, and alignment. They will learn how these principles contribute to creating visualisations that are not only aesthetically pleasing but also enhance the viewer’s understanding of the data being presented.  Students will use design tools to refine charts, graphs, and infographics. By choosing software like Canva, Microsoft Excel, or Power BI, students will engage with specific tutorials to practise refining and customising their visual elements. They will learn to select appropriate colour schemes, fonts and layouts, as well as employ visual storytelling techniques to make their visualisations more compelling and effective.  Students will critically evaluate the aesthetic and functional aspects of a data visualisation. After building their visualisations, students will reflect on the user experience (UX) by assessing both the visual appeal and the clarity of the information being presented. They will consider factors like readability, consistency, and user engagement, and discuss how design choices influence the effectiveness of the visualisation.  By developing their practical skills with graphic design tools, students will be equipped to create data stories that are not only informative but also visually engaging. This approach will enable them to apply their learning to Assessment task 2, where they can effectively combine design principles and technical skills to communicate insights through their chosen software. | Suggested adjusted activities. This section is also for use in school when making adjustments to support all students to achieve in their learning.  In creating or selecting scenarios, consider students’ own experiences and use of visuals.  Ensure all students understand both technical and culturally-based terms.  Include multiple opportunities to respond and discuss, for example:  **Verbally**   * individually * partner turn and talk.   **Non-verbally**   * gesture * response cards. |  |
| **Outcome**  **EC-12-07**  **EC-12-10**  **Content**  Students explain how user experience (UX) influences the development of effective data visualisations, including:   * **relevance to the audience** * **audience interpretation** * **customisation** * **live analysis.** | **Learning intention**  Understand the role of user experience (UX) in designing data visualisations that are intuitive and user-friendly.  **Success criteria**   * I can explain the importance of UX in creating accessible and engaging visualisations. * I can identify common UX principles that apply to data visualisation design. * I can apply UX strategies to improve the usability of a visualisation. * I can evaluate a visualisation based on how effectively it communicates to its intended audience.   **Teaching and learning activities**  **Teacher-led discussion on** how user experience (UX) influences the development of effective data visualisations.  **Activity 20:** how Spotify uses UX to enhance data visualisations in Wrapped.  Spotify Wrapped is a popular year-end feature that gives users a visual summary of their music listening habits for the year. Each year, Spotify presents this data through a series of fun, interactive and personalised data visualisations, summarising everything from users' most-played songs to the total time spent listening to music.  Spotify’s Wrapped feature is an excellent example of how user experience (UX) can influence the development of effective data visualisations. The service uses engaging graphics, clear labels and intuitive design to ensure users can easily interpret their data while feeling connected to their listening habits. The data is presented in a fun and creative way, making it relevant to users while also allowing for customisation, such as the ability to share highlights on social media.  **Students answer questions on the case study.** | Students will be able to explain the importance of UX in creating accessible and engaging visualisations. Through a teacher-led discussion, students will explore how user experience design prioritizes the needs, expectations, and interactions of users with visualisations. They will understand that focusing on UX helps create visualisations that are easy to interpret, visually engaging, and relevant to the audience’s goals and preferences.  Students will identify common UX principles that apply to data visualisation design. In class activities, students will discuss principles like simplicity, consistency, clarity, feedback, and user control. They will explore how these principles can be applied to make visualisations more intuitive, ensuring users can easily navigate and comprehend complex information without feeling overwhelmed.  Students will apply UX strategies to improve the usability of a visualisation. By examining case studies like Spotify Wrapped, students will explore practical UX strategies, such as using clear labels, interactive elements, and personalization options.  Students will evaluate a visualisation based on how effectively it communicates to its intended audience. After analysing examples like Spotify Wrapped, students will assess visualisations by considering factors such as clarity, relevance, and interactivity. They will reflect on how well a visualisation aligns with the audience’s preferences and objectives, and how UX considerations can shape the effectiveness of the data story being told. This evaluation will help them understand the critical role of UX in designing impactful data visualisations. | Suggested adjusted activities. This section is also for use in school when making adjustments to support all students to achieve in their learning. |  |
| **Outcomes**  **EC-12-10**  **Content**  Students develop and implement criteria for evaluating the effectiveness of user experiences | **Learning intention**  Develop criteria to evaluate the effectiveness of user experiences in data visualisations.  **Success criteria**   * I can create evaluation criteria for assessing the UX of a data visualisation. * I can apply the criteria to evaluate an existing visualisation. * I can reflect on how UX evaluation can lead to design improvements. * I can justify design decisions based on user feedback and experience.   **Teaching and learning activities**  Teacher-led discussion on developing and implementing criteria for evaluating the effectiveness of user experiences. Including discussion of what is heuristic evaluation and Jakob Nielsen's 10 usability heuristics for user interface design.  As a class discuss the 5 steps that help to develop and implement criteria for evaluating the effectiveness of user experiences.   * **Step 1**: understanding user needs in data visualisation * **Step 2**: developing evaluation criteria for data visualisation * **Step 3**: implementing the evaluation criteria * **Step 4**: measuring the effectiveness of data visualisations * **Step 5**: improving data visualisations based on evaluation   In groups, students discuss how they will apply this learning to Assessment task 2 when developing their own data visualisation and their criteria to evaluate effectiveness. | Students will be able to create evaluation criteria for assessing the UX of a data visualisation. Through a teacher-led discussion, students will explore the concept of UX and discuss the importance of heuristic evaluation based on Jakob Nielsen’s 10 usability heuristics. Students will collaboratively develop criteria such as clarity, interactivity, responsiveness, accessibility and relevance to effectively evaluate how well a data visualisation serves its users’ needs.  Students will apply the criteria to evaluate an existing visualisation. By working in groups and using the evaluation criteria they developed, students will assess an existing data visualisation for its effectiveness. This hands-on activity will help students understand how the different criteria affect the user’s experience and the quality of insights derived from the visualisation.  Students will reflect on how UX evaluation can lead to design improvements. After completing their evaluation, students will discuss as a class how their findings could be used to enhance the user experience. They will consider areas like improving data clarity, simplifying navigation and enhancing visual appeal. This reflection will emphasise the iterative nature of designing data visualisations that prioritise user needs.  Students will justify design decisions based on user feedback and experience. As they apply the steps discussed in the class, students will develop and test their own visualisations using the evaluation criteria. | Suggested adjusted activities. This section is also for use in school when making adjustments to support all students to achieve in their learning.  Students can engage with further reading about how Jakob Nielsen created the [10 Usability Heuristics](https://www.uxtigers.com/post/usability-heuristics-history)**.** |  |
| **Outcomes**  **EC-12-06**  **Content**  Students investigate the impact of emerging hardware and software technologies on user interface (UI) and UX design and development | **Learning intention**  Investigate how emerging technologies influence UI and UX design in data visualisations.  **Success criteria**   * I can identify emerging hardware and software technologies that affect UI/UX design. * I can explain how advancements in technology impact data visualisation design. * I can demonstrate how new tools or techniques can improve user interfaces. * I can reflect on how future trends may shape the design of enterprise computing systems.   **Teaching and learning activities**  **Teacher-led discussion on UI and UX. Class discussion on examining emerging hardware technologies including:**   * **Touchscreens and gestural interfaces** * Voice-controlled interfaces * Virtual reality (VR) and augmented reality (AR) * Wearable devices.   **Class discussion on e**merging software technologies and their impact on UI/UX including:   * Artificial intelligence (AI) and machine learning (ML) * Cloud computing * Progressiveweb apps (PWAs) * Naturallanguage processing (NLP).   **Activity 21:** investigating the impact of emerging technologies on UI/UX.  Students research and analyse how emerging hardware and software technologies impact the design and development of user interfaces (UI) and user experiences (UX).   1. **Research**   Choose one emerging hardware technology (for example VR, touchscreens, wearables) and one emerging software technology (for example AI, cloud computing, NLP).  Investigate how each technology impacts the design of user interfaces and the overall user experience.   1. **Analysis**   For each technology, answer the following questions:   * How has the technology influenced UI design? Provide specific examples. * How has it impacted UX, either positively or negatively? Provide specific examples. * What are some challenges or limitations in designing for this technology?  1. **Group discussion**   Students share their findings with their group or class and compare insights. Students identify trends across different technologies and discuss how designers might overcome the challenges associated with these technologies. | Students will be able to identify emerging hardware and software technologies that affect UI/UX design. Through teacher-led discussions and classroom activities, students will explore the latest advancements in both hardware, such as touchscreens, AR/VR, and wearable devices, and software, including AI, cloud computing, and natural language processing (NLP). They will gain an understanding of how these technologies create new possibilities and challenges in the design of data visualisations and enterprise computing systems.  Students will explain how advancements in technology impact data visualisation design. In their research and group discussions, students will analyse how new hardware technologies enable more immersive or intuitive interfaces, such as AR-enhanced visualisations or voice-controlled dashboards. Additionally, they will examine how software advancements like AI and machine learning enable more personalised, adaptive, and predictive visualisation features, improving the overall user experience.  Students will demonstrate how new tools or techniques can improve user interfaces. By researching specific technologies, students will explore and provide examples of new tools or techniques, such as voice commands, AI-powered chatbots, or VR-based data exploration, that enhance how users interact with data visualisations. They will discuss how these innovations can make interfaces more accessible, interactive, or intuitive for end users.  Students will reflect on how future trends may shape the design of enterprise computing systems. Through analysis and group discussions, students will identify trends across different emerging technologies and speculate on how these advancements may shape the design and functionality of enterprise systems in the future. They will consider challenges such as balancing accessibility with complexity, managing data privacy, and designing for an increasingly diverse range of devices and contexts. This reflection will deepen their understanding of the evolving landscape of UI/UX in data visualisation. | Suggested adjusted activities. This section is also for use in school when making adjustments to support all students to achieve in their learning. |  |

## Weeks 6–9

Table 6 – lesson sequence and details

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Outcomes and content | Teaching and learning activities | Evidence of learning | Differentiation and adjustments | Registration and evaluation notes |
| **Outcomes**  **EC-12-01**  **EC-12-03**  **EC-12-05**  **EC-12-06**  **EC-12-11**  **Content**  Students research, source, organise and store data appropriate for a data visualisation. | **Learning intention**  Effectively research, source, organise and store data for creating meaningful visualisations.  **Success criteria**   * I can identify appropriate sources for data relevant to a visualisation project. * I can demonstrate how to clean and organise data before visualisation. * I can explain how proper data storage ensures accuracy and reliability. * I can create a visualisation using well-organised and sourced data.   **Teaching and learning activities**  Teacher-led discussion on how creating effective data visualisations requires not only technical skills but also the ability to find and manage accurate, relevant data. Learning how to research, source, organise and store data that is suitable for creating meaningful visualisations is important.  This process involves several key steps: identifying the right data, making sure it is trustworthy, organising it effectively and storing it safely for future use.  The steps include:   1. Researching data 2. Sourcing data 3. Organising data 4. Storing data 5. Final considerations.   **Activity 22:** how to approach data.  In this scenario students imagine they are creating a data visualisation to show the rise of renewable energy usage in Australia. Students describe the processes of how you would approach research, source, organise and store data appropriate for a data visualisation.  **Students apply this learning to collecting data for Assessment task 2.** | Students will be able to identify appropriate sources for data relevant to a visualisation project. Through teacher-led discussions, students will learn how to research and locate credible and relevant data sources that align with their visualisation objectives. They will understand the importance of selecting trustworthy datasets from reputable databases, open data sources, government websites, and other authoritative channels.  Students will demonstrate how to clean and organise data before visualisation. In the classroom activities, students will practise data cleaning techniques such as removing duplicates, correcting errors, and standardising formats. They will also explore how to organise data by categorising and structuring it in spreadsheets or databases, ensuring that it is properly formatted for visualisation software.  Students will explain how proper data storage ensures accuracy and reliability. By discussing various storage methods, students will gain an understanding of how secure and organised storage, such as using cloud services or secure databases, prevents data loss or corruption. They will also learn about the importance of maintaining version control and backing up datasets to ensure the accuracy and reliability of the visualisation.  Students will create a visualisation using well-organised and sourced data. By applying the steps discussed, students will develop a data visualisation using relevant and well-prepared datasets. They will demonstrate their ability to move from data research and sourcing through to cleaning, organising, and storing, culminating in the creation of an accurate and meaningful visualisation. This practical approach will reinforce their understanding of the entire data visualisation process. | Suggested adjusted activities. This section is also for use in school when making adjustments to support all students to achieve in their learning. |  |
| **Outcomes**  **EC-12-01**  **EC-12-05**  **EC-12-06**  **EC-12-08**  **EC-12-11**  **Content**  Students design and develop a data visualisation for a specific scenario to represent trends, patterns and relationships, and illustrate predictive analysis incorporating big data. | **Learning intention**  Develop the ability to design and create data visualisations that represent trends, patterns and relationships in a given scenario.  **Success criteria**   * I can design a visualisation that effectively communicates trends or relationships in a dataset. * I can apply appropriate tools and techniques to represent the data visually. * I can evaluate the effectiveness of the visualisation in communicating insights. * I can justify design decisions based on the clarity and usefulness of the visualisation.   **Teaching and learning activities**  As a class, students are introduced to **Assessment task 2. Students have class time to work on the assessment task and receive support and feedback from their teacher through the following stages:**   * **Identifying and defining** * **Researching and planning** * **Producing and implementing** * **Testing and evaluating.**   **Step 1:** understand the purpose of data visualisation  Data visualisation is more than just creating charts or graphs; it is about communicating complex information in a way that is clear, insightful and impactful. When developing a visualisation, you aim to represent data trends, patterns, and relationships effectively, enabling your audience to grasp critical insights at a glance. Think of your visualisation as a storytelling tool, guiding your audience through the narrative that your data presents.  **Step 2:** identify and define your scenario  Choose a specific scenario that aligns with your task requirements. For instance, you could focus on an enterprise, social, or ethical issue. It is essential to clearly define:   * Who is your audience? * What do you want them to learn or understand from your visualisation? * What problem or question are you addressing?   Having clear answers to these questions will shape how you select, analyse, and present your data.  **Step 3:** select relevant data and tools  To ensure your visualisation is both meaningful and accurate, research, source, and organise data that is relevant to your chosen scenario. Look for datasets that are comprehensive, reliable and reflective of the trends or relationships you aim to highlight. Remember to:   * Use appropriate tools like Excel, Canva (Flourish) or Power BI for your data analysis and visualisation. * Ensure your dataset is of adequate size to reflect the trends or patterns clearly.   **Step 4:** analyse your data for patterns, trends and relationships  Once you have your data, use analytical techniques to identify key patterns or relationships. This is where you compare datasets and look for emerging trends. Consider asking questions like:   * What trends do I observe over time? * Are there significant correlations between variables? * What predictions can I make based on these trends?   Make use of statistical and analytical tools within your chosen software to validate your observations and predictions. Predictive analysis involves using historical data to forecast future trends. For instance, if you’re examining sales data, you might use predictive algorithms to estimate future sales.  **Step 5:** create your visualisation with clarity and purpose  Design your visualisation by applying best practices:   * Choose the right chart type: use bar charts to compare categories, line charts for time-series trends or scatter plots to show correlations. * Avoid visual clutter: keep your design simple and focused. Avoid unnecessary 3D effects, overly bright colours or complex layouts. * Add clear labels and legends: ensure that each part of your visualisation is easy to interpret.   Incorporating big data means acknowledging that your datasets may be extensive and complex. Break your visualisation into multiple views if necessary to avoid overwhelming the audience.  **Step 6:** reflect on your visualisation’s effectiveness  After creating your visualisation, evaluate its clarity and effectiveness:   * Does it tell a compelling story? * Does it accurately represent the trends or relationships identified? * Is the key message clear without needing additional explanations?   Students seek feedback from peers to refine their visualisation and improve its clarity and accuracy. | Students design effective visualisations that communicate trends, patterns, or relationships within their chosen dataset, demonstrating an understanding of audience needs and visual storytelling principles.  Students apply appropriate tools and techniques to analyse and visually represent data using software such as Excel, Canva, or Power BI, reflecting purposeful and accurate use of the software’s features.  Students evaluate the effectiveness of their visualisations through reflection and peer-feedback, identifying areas for improvement and refining their visualisations for clarity and impact.  Students justify their design decisions by providing reasoned explanations for the chosen visual elements, chart types, data selection and layout, ensuring the visualisation enhances readability and audience understanding.  Students receive support from the teacher in development of their assessment and summative feedback. | Suggested adjusted activities. This section is also for use in school when making adjustments to support all students to achieve in their learning. |  |

## Week 10

Table 7 – lesson sequence and details

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Outcomes and content | Teaching and learning activities | Evidence of learning | Differentiation and adjustments | Registration and evaluation notes |
| **Outcomes**  **EC-12-03**  **Content**  Students investigate and implement methods to maintain data security, including:   * **cybersecurity** * **data backup.** | **Learning intention**  Investigate methods for maintaining data security when handling and visualising enterprise data.  **Success criteria**   * I can identify potential security risks when collecting, storing, or visualising data. * I can propose methods to secure sensitive data in enterprise environments. * I can implement data security practices in a visualisation project. * I can evaluate the effectiveness of the security measures used in protecting data integrity.   **Teaching and learning activities**  **Teacher-led discussion on cybersecurity and protecting data during visualisation, access controls and using secure platforms.**  **Activity 23:** high school scenario.  Students imagine your school creating a visualisation of student performance data. The visualisation includes grades, attendance records and participation in extracurricular activities. This data will be shared with teachers and administrators to help improve student outcomes.  If this data were to fall into the wrong hands, it could be misused. By applying cybersecurity measures like encryption and access controls, the school can ensure that only authorised teachers and administrators can view or modify the data.  Students answer reflection questions on the scenario.  **Teacher-led discussion on maintaining data security, cybersecurity and data backup.**  **Activity 24:** company sales dashboard.  **Scenario**  Consider a company that has created a dashboard showing sales trends. If the company’s database is compromised, the visualisation could be lost. However, if the data is backed up regularly, the company can quickly restore the database and continue to use the dashboard without significant disruption.  A company has created a dashboard that visualises sales trends over the past year. The data is stored in a database that is regularly backed up.  One day, the database is compromised due to a cyberattack.  **Activity 25**: reflection questions.  How do cybersecurity and data backup practices contribute to the overall reliability and trustworthiness of data visualisations?  Why is it important to consider data security when creating visualisations that will be shared with others?  **Activity 26:** investigate and implement methods to maintain data security.  Data security is very important. Examine this [data visualisation](https://informationisbeautiful.net/visualizations/worlds-biggest-data-breaches-hacks/) of data breaches from across the world.  Answer the following questions on methods to maintain data security.   * What are some potential security risks when collecting, storing, or visualising data? * How would you secure sensitive data in an enterprise environment? * What data security practices would you implement in a visualisation project? * How would you evaluate the effectiveness of the security measures used in protecting data integrity? | Students will be able to identify potential security risks when collecting, storing, or visualising data. Through a teacher-led discussion and scenario-based activities, students will explore various risks such as unauthorised access, data breaches, loss of data integrity, and threats to data availability. They will learn to recognise vulnerabilities that could compromise data security in different stages of data handling, from collection to visualisation.  Students will propose methods to secure sensitive data in enterprise environments. By analysing the company sales dashboard scenario, students will understand the importance of cybersecurity practices like regular backups, encryption, and access control. They will brainstorm and propose solutions such as using secure servers, implementing role-based access, and establishing regular security audits to safeguard data integrity and prevent unauthorised modifications.  Students will implement data security practices in a visualisation project. In activity 26, students will investigate real-world data breaches and reflect on the importance of securing sensitive data. They will practice implementing data security measures within their visualisation projects, such as encrypting sensitive information and creating secure channels for data transfers. This hands-on experience will help them apply theoretical knowledge to practical situations.  Students will evaluate the effectiveness of the security measures used in protecting data integrity. By answering reflection questions, students will critically assess the reliability and trustworthiness of visualisations in the context of cybersecurity practices. They will consider the effectiveness of measures like data backups and encryption, discussing how these practices contribute to minimising risks and maintaining the overall integrity of enterprise data visualisations. This reflection will deepen their understanding of the relationship between data security and reliable visualisations. | Suggested adjusted activities. This section is also for use in school when making adjustments to support all students to achieve in their learning.  In creating or selecting scenarios, consider students’ own experiences and use of visuals.  Ensure all students understand both technical and culturally-based terms.  Include multiple opportunities to respond and discuss, for example:  **Verbally**   * individually * partner turn and talk.   **Non-verbally**   * gesture * response cards. |  |

# Overall program evaluation

Collating ongoing evaluations and reflecting on the strengths and areas for development within the program creates opportunities to enhance student outcomes. The following prompts can be used to support your evaluation of the program:

* Did the program assist all students to improve in their learning?
* How could the sequencing of the program be improved?
* What did the student evaluations of the program indicate? How can these be actioned to improve the program?
* The strategies and resources that were most effective for student learning were …
* Teaching strategies and resources that would benefit from review and refinement are …

## Capturing student voice when evaluating a program

Student voice is useful in the evaluation process for programs. The statements below could be useful as a starting point when asking students to provide feedback on their learning experiences. These statements are derived from some of the themes from [What works best 2020 update](https://education.nsw.gov.au/about-us/education-data-and-research/cese/publications/research-reports/what-works-best-2020-update) (CESE 2020a) and could be useful in teacher reflection on how these themes could be incorporated into a teaching program. The statements could also prompt student reflection on their metacognitive processes while learning.

**Please rate how much you agree with these statements:**

* My teacher had confidence that I could achieve and improve in my learning. (CESE 2020a Chapter 1: High expectations)
* I had a clear idea of what I was learning and why. (CESE 2020a Chapter 2: Explicit teaching)
* I used the feedback provided to improve my performance. (CESE 2020a Chapter 3: Effective feedback)
* I understood the feedback on the assessment task. (CESE 2020a Chapter 3: Effective feedback)
* I was able to predict the marks I achieved in the assessment tasks. (CESE 2020a Chapter 5: Assessment)
* The activities in the unit prepared me for the assessment task. (CESE 2020a Chapter 5: Assessment)
* I found the activities in the lessons interesting to me. (CESE 2020a Chapter 7: Wellbeing)
* I made valuable contributions to the class during this unit. (CESE 2020a Chapter 7: Wellbeing)
* I ask questions in class when I don’t understand yet. (CESE 2020a Chapter 7: Wellbeing)

**Optional open-ended prompts:**

* The lessons and/or activities that I most enjoyed were when we … because …
* When the learning was difficult, the strategy I used was …
* If I was giving advice to a student who was starting this unit I would tell them to …
* If I was giving advice to a teacher who was teaching this unit I would tell them to …

# 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).

**Differentiation:** further advice to support Aboriginal and Torres Strait Islander students, English as an additional language or dialect (EAL/D) students, students with a disability and/or additional needs and High Potential and Gifted (HPG) 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 Policy](https://education.nsw.gov.au/policy-library/policies/pd-2016-0468)

**Alignment to the School Excellence Framework**: this resource supports the [School Excellence Framework](https://education.nsw.gov.au/inside-the-department/directory-a-z/strategic-school-improvement/school-excellence-framework) elements of curriculum (curriculum provision) and effective classroom practice (lesson planning, explicit teaching).

**Alignment to Australian Professional Standards for Teachers**: 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.

**Creation date:** 2024

# Evidence base

[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.

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# References

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NESA holds the only official and up-to-date versions of the NSW Curriculum and syllabus documents. Please visit the NSW Education Standards Authority (NESA) website <https://educationstandards.nsw.edu.au/> and the NSW Curriculum website [https://curriculum.nsw.edu.au/home](https://curriculum.nsw.edu.au/).

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