National Unit Specification

General information

Unit title: Data Citizenship (SCQF level 5)

Unit code: J2HN 45

Superclass:	CB
Publication date:	November 2019
Source:	Scottish Qualifications Authority
Version:	03

Unit purpose

The purpose of this unit is to provide an overview on the place of data in society, how data can be used and misused, and the steps we can take to understand and use data responsibly. This unit will help learners become responsible, data literate citizens who participate in the decisions that affect people and society.

This is a **non-specialist unit**, suitable for a wide range of learners. It is suitable for learners who require an introduction to data science and data literacy, and understand how these skills help them to be responsible citizens. No previous experience is required but a familiarity with computers is desirable. The themes in this unit follow on from the outcomes and benchmarks in Digital Literacy at level 4 in the broad general education phase of the Scottish curriculum.

Learners will gain a range of practical skills and acquire relevant underpinning knowledge. They will learn how to interpret meaning from visualisations, such as graphs and charts, and to create visualisations from data. They will learn about how data can be used in society for positive and negative effects. They will also learn about data security and their rights and responsibilities as data subjects and data owners.

On completion of this unit, learners will have gained confidence in their use of data, and be aware of their rights and responsibilities as data citizens. Learners may progress to other units at this level, such as J2G2 46 *Data Science* at SCQF level 6, or further develop their knowledge and skills in this area by undertaking J2HN 46 *Data Citizenship* at SCQF level 6.

National Unit Specification: General information (cont)

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Outcomes

On successful completion of the unit the learner will be able to:

1   Describe the use of data in society.
2   Explain data literacy concepts.
3   Interpret data.

Credit points and level

1 National Unit credit at SCQF level 5: (6 SCQF credit points at SCQF level 5)

Recommended entry to the unit

No specific knowledge or experience is required. However, basic digital and numerical literacy is assumed.

Core Skills

Achievement of this Unit gives automatic certification of the following Core Skills component:

Core Skill component   Critical Thinking at SCQF level 5

Context for delivery

If this unit is delivered as part of a group award, it is recommended that it should be taught and assessed within the subject area of the group award to which it contributes. For example, if this unit is delivered as part of the National Progression Award in Data Science at SCQF level 6 there is overlap with other units within this award (particularly J2G2 46 *Data Science*) and there will be opportunities to contextualise and integrate teaching, learning and assessment across component units.

The Assessment Support Pack (ASP) for this unit provides assessment and marking guidelines that exemplify the national standard for achievement. It is a valid, reliable and practicable assessment. Centres wishing to develop their own assessments should refer to the ASP to ensure a comparable standard. A list of existing ASPs is available to download from SQA's website (http://www.sqa.org.uk/sqa/46233.2769.html).

Equality and inclusion

This unit specification has been designed to ensure that there are no unnecessary barriers to learning or assessment. The individual needs of learners should be taken into account when planning learning experiences, selecting assessment methods or considering alternative evidence.

Further advice can be found on our website **www.sqa.org.uk/assessmentarrangements**.

National Unit Specification: Statement of standards

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Acceptable performance in this unit will be the satisfactory achievement of the standards set out in this part of the unit specification. All sections of the statement of standards are mandatory and cannot be altered without reference to SQA.

Where evidence for outcomes is assessed on a sample basis, the whole of the content listed in the knowledge and/or skills section must be taught and available for assessment. Learners should not know in advance the items on which they will be assessed and different items should be sampled on each assessment occasion.

Outcome 1

Describe the use of data in society.

Performance criteria

(a) Describe the reasons for the growth of data.
(b) Describe how data is used and misused by individuals, organisations and society.
(c) Describe types of bias and its impact on individuals and society.
(d) Describe sources of public and private data and the concept of open data.
(e) Describe the rights and responsibilities of data subjects and data owners.

Outcome 2

Explain data literacy concepts.

Performance criteria

(a) Explain the characteristics of high quality data.
(b) Explain how data can be analysed.
(c) Explain types of data visualisations and the best use of each type.
(d) Explain methods of managing and securing data.

Outcome 3

Interpret data.

Performance criteria

(a) Extract information from data visualisations and dashboards.
(b) Interpret data to identify patterns and trends and draw conclusions.
(c) Create appropriate visualisations from data.
(d) Communicate findings and make recommendations based on conclusions.

National Unit Specification: Statement of standards (cont)

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Evidence requirements for this unit

Learners will need to provide evidence to demonstrate the performance criteria across all outcomes. The evidence requirements for this unit will take **two** forms.

1   Knowledge evidence
2   Product evidence

The **knowledge evidence** will relate to Outcome 1 and Outcome 2. The knowledge evidence may be written or oral or a combination of these. The amount of evidence may be the minimum required to infer competence across both outcomes. For example, the descriptions of how data is used by individuals, organisations and society can be relatively superficial so long as the main uses of each is described. Similarly, the explanations in Outcome 2 do not have to be detailed but sufficient to imply competence in all of the performance criteria. For example, it would be adequate for learners to explain two or three methods of managing and securing data (Performance Criterion (d)), which might include relatively simple situations with which the learner is familiar.

An important aspect of the evidence is the learner's correct use of language, specifically technical terminology, which must be demonstrated in their descriptions and explanations.

The knowledge evidence may be sampled when testing is used. Testing must be carried out under supervised conditions and must be controlled in terms of location and time. Access to reference material is not permitted. The sampling frame, on all occasions, must include Outcome 1 and Outcome 2 (but not every performance criterion within each outcome). The sampling frame must always include Outcome 1, Performance Criterion (b) and Performance Criterion (e) and Outcome 2, Performance Criterion (a).

The **product evidence** will relate to Outcome 3. The product evidence will involve extracting information from visualisations and dashboards, and an interpretation of a dataset. The dataset will be supplied to the learner and must comprise at least 1,000 items. The learner must explore the data and make conclusions and decisions from it. Learners must also create visualisations to provide insights into the data.

The evidence must be produced by the learner without assistance. It may be produced in lightly controlled conditions, over an extended period of time, at times and places at the discretion of the learner.

The SCQF level of this unit (level 5) provides additional context on the nature of the required evidence and the associated standards. Appropriate level descriptors should be used when making judgements about the evidence.

When evidence is produced in loosely controlled conditions it must be authenticated. The guide to assessment provides further advice on methods of authentication.

The support notes section of this specification provides specific examples of instruments of assessment that will generate the required evidence.

National Unit Support Notes

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Unit support notes are offered as guidance and are not mandatory.

While the exact time allocated to this unit is at the discretion of the centre, the notional design length is 40 hours.

Guidance on the content and context for this unit

This unit is mandatory for the NPA Data Science at level 5. On successful completion, it will allow progression to *Digital Citizenship* at level 6. There is an emphasis on both the development of practical skills as well as gaining relevant knowledge and understanding.

Please note that the following guidance, relating to specific outcomes, does not seek to explain each performance criterion. It seeks to clarify the statement of standards where it is potentially ambiguous. It also focuses on non-apparent teaching and learning issues that may be over-looked, or not emphasised, during unit delivery. As such, it is not representative of the relative importance of each outcome or performance criterion.

Outcome 1: Describe the use of data in society.

This outcome allows learners to recognise the use and limitations of data in society. A variety of real examples can be used to illustrate why data is used, but also the limitations and impact it can have on decision making in society.

Different types of bias should be explored including algorithmic, programming, black box algorithms and use of machine learning systems.

Legislation that could be explored includes Freedom of Information, General Data Protection Regulations and Computer Misuse.

Although learners will discover sources of public and private data, they should also think about the data they generate in regards to personal data privacy, and know how to change their settings to public or private. This could include discussion of, for example, location tracking, digital surveillance or facial recognition.

It is hoped that learners will get a balanced view of the use of data in society, that although bias, privacy and security can impact on individuals, there are many examples of data being used for social good and impacting positively on individuals and communities.

Outcome 2: Explain data literacy concepts.

This outcome is centred around understanding data literacy. This would include areas such as how to use data, when to use different sources of data, strategies for managing and securing data, and different ways to visualise data.

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Features of quality data should be examined, eg, accuracy, validity, reliability, currency, timeliness, completeness. This could include learning to avoid the use of data that is out of date, inaccurate, incomplete or gathered from a small sample size.

Learners will learn simple strategies for analysing data, such as averages (mean, median and mode), sampling and surveying, and data errors (false positives and false negatives).

Learners should recognise that visualisations can represent different types of data and be able to justify why certain visualisations are more suitable than others for given scenarios. Learners will extract meaning from graphs and charts, including discussion about which visualisations are best for which purpose. Data visualisations that could be explored include bar charts, pie charts, scatter and bubble diagrams, box and whisker charts, infographics, word clouds, circumplex charts, heat maps, etc.

Learners should be able to interpret what different types of visualisations show as well as the limitations, weaknesses and bias different visualisations show. For example, the use of colour (eg, red/green) in visualisations can indicate 'good or bad', the use of graphs where the axis does not begin at zero, biased language and sample selection bias.

Strategies for keeping personal data secure might include methods such as strong passwords, facial recognition, two-factor authenticity and encryption.

Outcome 3: Interpret data.

This outcome is based around applying learner's knowledge of, and competency in, data literacy concepts from Outcome 2. This would include areas such as:

♦   Selecting the best type of visualisations to suit the data and the purpose
♦   Mean, median and mode
♦   Sampling and surveying
♦   Differentiating between qualitative and quantitative data
♦   Data errors: false positives and false negatives

Learners should have the opportunity to use data analysis tools to explore and draw conclusions from data from different sources. There is an opportunity to develop the use of learners' digital skills by creating visualisations as well as recognising when they can be used for different types of data.

Learners should be introduced to a range of sources of data such as surveys/questionnaires (eg, census and polls), public or open data, and a range of online data sources.

Learners should have the opportunity to use data analysis tools to explore and draw conclusions from data from multiple sources. Tools could include Common Online Data Analysis Platform (CODAP), Gapminder, Excel and Tableau. Adobe Spark Post, vector graphic and diagramming tools can be used to create infographics and other data visualisations. There are a variety of websites that can be used to create word clouds (eg, Wordle).

National Unit Support Notes (cont)

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Guidance on approaches to delivery of this unit

It is recommended that the unit is delivered in the order provided. It is recognised that some specialist software is required to undertake data visualisation, but there are free tools available online.

Learners should have opportunities to examine real life examples throughout the unit. For example, they can examine a range of issues in their local area and investigate how data is used to make decisions. They could use data to examine where a new community facility could be opened or where a new school situated. They should be encouraged to consider examples from the news and to discuss these in class.

A suggested distribution of time, across the outcomes, is:

♦   Outcome 1: 10 hours
♦   Outcome 2: 10 hours
♦   Outcome 3: 20 hours

Guidance on approaches to assessment of this unit

Evidence can be generated using different types of assessment. The following are suggestions only. There may be other methods that would be more suitable to learners.

Centres are reminded that prior verification of centre-devised assessments would help to ensure that the national standard is being met. Where learners experience a range of assessment methods, this helps them to develop different skills that should be transferable to work or further and higher education.

These outcomes can be assessed in a variety of ways. A traditional approach would involve testing knowledge via a response instrument (such as a written assessment). If such an approach is adopted, it is recommended that all of the knowledge and understanding in this unit is combined into a single assessment with an appropriate pass mark. For example, an assessment comprising of 20 marks could have a pass mark of 12. It is also recommended that some of the questions combine knowledge and understanding across the relevant performance criteria. This assessment would be taken unseen under controlled conditions.

Although there is a high degree of knowledge evidence required for this unit, this does not have to take the form of a test paper. For example, a blog could be created, a presentation constructed, video recordings or posters made.

A more contemporary approach to assessment would involve the use of a web log (blog) to record learning (and the associated activities) throughout the life of the unit eg, for Outcomes 1 and 2. The blog would provide knowledge evidence (in the descriptions and explanations) and product evidence (using, for example, video recordings) to show the learner using data analysis tools and drawing conclusions from it.

National Unit Support Notes (cont)

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Formative assessment could be used to assess learners' knowledge at various stages throughout the life of the unit. An ideal time to gauge their knowledge would be at the end of each outcome. This assessment could be delivered through an item bank of selected response questions, providing diagnostic feedback to learners.

If a blog is used for summative assessment, it would also facilitate formative assessment since learning (including misconceptions) would be apparent from the blog, and intervention could take place to correct misunderstandings on an on-going basis.

Opportunities for e-assessment

E-assessment may be appropriate for some assessments in this unit. By e-assessment we mean assessment which is supported by Information and Communication Technology (ICT), such as e-testing or the use of e-portfolios or social software.

Centres which wish to use e-assessment must ensure that the national standard is applied to all learner evidence and that conditions of assessment as specified in the Evidence Requirements are met, regardless of the mode of gathering evidence. The most up-to-date guidance on the use of e-assessment to support SQA's qualifications is available at **www.sqa.org.uk/e-assessment**.

Opportunities within this unit to develop core skills

The Critical Thinking component of Problem Solving at SCQF level 5 is embedded in this unit. When a learner achieves the unit, their Core Skills profile will also be updated to include this component.

Learners will be provided with ample opportunity to develop the following Core Skills:

♦ **Information and Communication Technology:** The unit provides the opportunity to use ICT and further develop digital literacy skills while exploring data and creating data visualisations. Depending on the types of visualisations explored, learners may have the opportunity to handle numerical and graphical information.
♦ **Communication:** Learners will develop and practice both oral and written communication throughout this unit via individual and group exercises.
♦ **Numeracy:** Through statistical analysis and data visualisation learners will have several opportunities to develop numeracy skills throughout this unit.
♦ **Problem Solving:** The type of analysis, activities, assignments, and assessment experienced throughout this unit will require learners to apply critical thinking, plan and organise data analysis and review and evaluate both their results and the work of others.

Opportunities within this unit to develop broader skills in the areas of enterprise, employability, sustainable development and citizenship.

♦ Teamwork and collaboration skills
♦ Communication skills
♦ Problem-solving skills
♦ Locating information skills
♦ Observation skills

The unit encourages the development of citizenship skills and the appropriate use of data in decision making. There are opportunities for collaborative work throughout.

History of changes to unit

Version	Description of change	Date
03	Core Skills Component Critical Thinking at SCQF level 5 embedded	18/11/19
02	Unit codes changed due to hierarchy	23/08/19

General information for learners

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This section will help you decide whether this is the unit for you by explaining what the unit is about, what you should know or be able to do before you start, what you will need to do during the unit and opportunities for further learning and employment.

This unit will introduce you to the world of data science. The unit is about developing your data citizenship skills that are required in life and society. You will develop your knowledge of how to use, present and analyse data, as well as exploring how data is used in the world you live in today. It is not necessary for you to have studied data citizenship before.

You will gain a range of practical skills in creating and interpreting data visualisations such as graphs and charts, and how these are used for positive and negative effects. You will consider the ethical use of data and how it can be used to benefit society. You will learn about data privacy, how to keep data about yourself safe and secure, and about the use of your data and the rights and responsibilities you have. You will develop your ability to analyse data and how to create appropriate visual images to represent data. It is designed to be highly practical.

These skills are expected to be in high demand from employers over the coming years. You will have the opportunity to look at a range of recent, real-life examples.

Assessment could be quite a few different things. It might combine a short, written test, creating and maintaining a portfolio of your work throughout the unit, or having presentations or posters that you make being marked. Your teacher will let you know how you will be assessed.

There is no automatic certification of Core Skills in this unit, but you will have the opportunity to develop your information and communication technology, numeracy, communication and problem solving skills. The unit encourages the development of citizenship skills and the appropriate use of data in decision making. There are opportunities for collaborative work throughout.

You will develop your ability to analyse and present data in multiple ways. This might involve working on paper or may involve presenting data electronically. From this you will be better equipped to make comparisons and decisions when looking at data in the modern world.

Once you complete the unit, you will be able to progress to *Data Citizenship* at level 6.