Next Generation Higher National Educator Guide

Higher National Diploma in Data Science

Group award code GT9A 48

Valid from Session 2024 to 2025

Prototype educator guide for use in pilot delivery only (version 0.1) June 2024

This guide provides detailed information about the group award to ensure consistent and transparent assessment year on year.

This guide is for assessors and lecturers and contains all the mandatory information you need to deliver and assess the group award.

This edition: June 2024 (version 0.1)

Contents

Group award overview

Introduction

This guide:

- assists centres to implement, deliver, and manage the group award
- provides a guide for new staff involved in offering the group award
- informs course managers, teaching staff, assessors, learners, employers, and higher education institutions of the aims and purpose of the group award
- provides details about the range of learners that the group award is suitable for and the progression opportunities

Purpose of the group award

This qualification provides learners with the opportunity to gain the knowledge, understanding and skills they need to pursue a career in data and its analysis, and progress to higher levels of study in data science. They gain competence in accurately formulating a data question, carrying out reproducible analysis on large datasets, and presenting findings in an actionable format.

This qualification covers topics such as:

- locating and accessing data sources
- transforming data for analysis
- analysing data
- visualising and communicating data
- implementing machine learning models

Learners understand how to manage data assets and plan for data analysis by applying project management approaches, and develop their meta-skills and personal professionalism.

Career opportunities include working as a data scientist in the areas of health science, the public sector, industry, commerce or entertainment, with an emphasis on algorithm creation and refinement to build better predictive models. This involves extracting information and insights from large datasets to understand the past and current performances of an organisation, making informed decisions, and predicting future trends.

Structure

Higher National Diplomas (HNDs) are designed at SCQF level 8 and consist of 120 SCQF credit points. HNDs must incorporate at least 80 SQA credit points (10 SQA credits) at SCQF level 8.

HNDs contain 15 credits that can be used flexibly to increase opportunities for learners returning to education. Refer to the 'Meta-skills' section of this guide for more information.

HND Data Science meets the Next Generation Higher National (NextGen: HN) design principles by incorporating a mandatory project unit (Professional Practice in Data Science at SCQF level 8) with an SQA credit value of 4. It also reduces the number of distinct units from around 12 in the previous HND Data Science to 6 in the NextGen: HN version, with a corresponding reduction in assessment load for learners.

Framework

HND Data Science is made up of two mandatory units (7 SQA credits) and 8 SQA credits of the following optional units (15 SQA credits in total).

Mandatory units (7 SQA credits)

Unit code	Unit title	SQA credit	SCQF credit points	SCQF level
J6C5 48	Data Science	3	24	8
J6C6 48	Professional Practice in Data Science	4	32	8

Optional units (8 SQA credits)

Unit code	Unit title	SQA credit	SCQF credit points	SCQF level
J6C9 48	Agile Project Management	2	16	8
J6CA 48	Artificial Intelligence	2	16	8
J6CB 48	Big Data	2	16	8
J6CC 48	Cloud Computing	2	16	8
J6CD 48	Data Engineering	3	24	8
J6CL 49	Data Engineering	2	16	9
J6CE 48	Data Flow	2	16	8
J6CM 48	Data Management	1	8	8
J6CF 48	Data Visualisation	2	16	8
J6CN 48	Machine Learning	2	16	8
J6CP 49	Machine Learning	2	16	9
J6CH 48	Mathematics for Data	2	16	8
J6CJ 48	NoSQL Databases	2	16	8
J6CK 48	Probability and Statistics in Data Science	3	24	8

To be successful in this qualification, learners must achieve both mandatory units (7 SQA credits) and also pass sufficient optional units to achieve at least another 8 SQA credits.

There are no restrictions on the choice of optional units in this qualification.

Aims of the group award

HND Data Science aims to provide a solid foundation of knowledge and skills, enabling learners to:

- gather and use data to uncover patterns and trends
- build models to make predictions for the future
- support decision making

As a multi-disciplinary subject, HND Data Science requires understanding of mathematical, statistical and programming concepts, and skills in using the tools and software that enable modern data science practices.

General aims

The general aims of the group award are to develop learners':

1 academic abilities, consistent with the SCQF level of the qualification, to facilitate progression to further studies
2 analysis and communication skills, to prepare them to work in a data professional role
3 range of technical skills, particularly computational and statistical skills
4 range of meta-skills, particularly those required in an analytical profession
5 awareness of data governance and ethics
6 awareness of data science as a career, and improve the supply of skilled data professionals

Specific aims

The specific aims of the group award are for learners to:

1 develop the analytical and communication skills necessary for a data professional role
2 develop skills in locating, accessing and combining data sources; and inspecting, cleansing and transforming data for analysis
3 instil adherence to regulatory, legal, ethical and governance standards when working with data
4 understand how data and analysis may exhibit biases and prejudice, and how risks are mitigated
5 develop understanding of the data life cycle and the steps involved in data analysis tasks
6 develop understanding of mathematical, statistical and computational data modelling techniques
7 demonstrate tools and techniques available for data analysis, including programming languages and notebooks, packages and visualisation aids

8   understand the analysis of large and/or complex datasets to create data models, visualisations and dashboards that provide insights and inform decisions

9   develop skills in the automation of analysis of large datasets, to create a reproducible process

10 collaborate in the application of data science concepts and methods to analyse large complex datasets and communicate the results

Group award structure

The group award structure mirrors that set out in the NextGen: HN Design Rules. There are two mandatory units, of which one is the project unit (Professional Practice in Data Science — 4 SQA credits) and the other a unit that covers the concepts that are essential to the practice of data science (Data Science — 3 SQA credits). The project unit gives learners an opportunity to integrate the knowledge and skills covered in the Data Science unit and/or explore a data science topic in depth from the set of optional units.

The optional units go beyond the minimum viable product concept and enable learners to develop an area of specialism, such as data modelling, artificial intelligence or big data. The framework also includes two SCQF level 9 units, to allow learners to advance their knowledge and skills in particular aspects of data science.

Who is this group award for?

This group award is suitable for learners who wish to develop knowledge and skills in the growing area of data analysis and data modelling. It is particularly suitable for learners with a prior background in a computing-related subject or those who wish to pursue a career in science, technology, engineering, and mathematics (STEM).

Recommended entry	Progression
Entry to this group award is at the discretion of the centre. Learners would benefit from having attained the skills, knowledge, and understanding required by one or more of the following or equivalent qualifications and/or experience: • HNC Computing GT6G 47 • PDA Data Science GR68 47	Learners can progress to: • other qualifications in data science or related areas • degree-level study in data science • employment and/or training in data science

HND Data Science may be of interest to graduates in other subjects (or learners who did not complete a degree).

Recognising prior learning

SQA recognises that learners gain knowledge and skills through formal, non-formal, and informal learning contexts.

It is unlikely that a learner would have the appropriate prior learning and experience to meet the requirements of a full group award in its entirety.

You can find more information and guidance about the recognition of prior learning on [SQA's website](#).

Articulation and/or progression

HND Data Science is not designed to articulate to any particular degree programme. It does, however, provide a sound basis for progression to degree programmes or other qualifications at SCQF level 9 in data science, as well as topics in computer science. Learners can also progress to employment in data science.

Professional recognition

HND Data Science does not lead to professional recognition.

Credit transfer arrangements

Centres can make decisions about transferring credits. They can transfer credits if the
subject-related content of the units is broadly equivalent. Centres should consider the currency of a learner's achievement before transferring credit.

Core Skills entry profile

The Core Skills entry profile provides a summary of the assessment activities that demonstrate the SCQF level of this group award. This information can help identify learners who need additional support or those who should take an alternative level or learning programme.

Core Skill	Recommended SCQF entry profile	Associated assessment activities
Communication	Level 6	Learners can evidence this skill by: • giving a work briefing for performance of a complex task • making a sustained and coherent argument on a complex topic • making a formal presentation which collates, analyses, and presents conclusions on findings • summarising and evaluating research reports • producing a well-structured report of a complex, practical investigation
Numeracy	Level 6	Learners can evidence this skill by: • performing calculations involving complex data (such as financial data) • using formulae to calculate values • researching and comparing local data with national statistics

Core Skill	Recommended SCQF entry profile	Associated assessment activities
Information and communications technology (ICT)	Level 6	Learners can evidence this skill by: • searching multiple external and internal databases • using a software package to analyse data • recording a video on a mobile device and uploading it to video streaming services
Problem solving	Level 6	Learners can evidence this skill by: • analysing the significance and relevance of variables in a situation • summarising, explaining or drawing conclusions • identifying resources and ensuring they have what they need • deciding how a task will be managed and carrying it out • analysing the effectiveness of all aspects of a problem-solving strategy • identifying and gathering appropriate evidence to support an evaluation

Core Skill	Recommended SCQF entry profile	Associated assessment activities
Working with others	Level 6	Learners can evidence this skill by: • analysing the requirements of roles and the relationships between them • negotiating working methods with team members • developing evaluation criteria for cooperative work • using their own reflection and the feedback they receive to identify learning objectives

Meta-skills

Meta-skills are higher-order skills that support the development of other skills and promote success in any context. They enable learners to respond to professional challenges and opportunities by reflecting on, developing, applying and adapting industry skills and sector knowledge.

Our new Higher National Qualifications are developed with meta-skills at their core. Meta-skills complement the industry and sector-specific content of the qualifications. They provide a framework for learners to complete personal development aligned to professional practices.

Throughout the qualifications, learners develop meta-skills while studying industry and
sector-specific content. You can integrate meta-skills into contextualised teaching activities and include them in integrated and holistic assessment approaches.

The 21st century skills and meta-skills learning, teaching and assessment model focuses on how we can use skills to respond to societal, economic and industry drivers and change.
Meta-skills frameworks vary, but they share an approach that emphasises individualistic, context-based skills development with reflective practice and localised definitions.

Skills Development Scotland developed a model of meta-skills in response to the concept of Industry 4.0 (or the 'fourth industrial revolution'). In this model, they identify 12 meta-skills that help learners adapt to changes to industry, job roles and society expected as a result of technological advances and global trends. Developing these meta-skills supports learners as they prepare for a constantly evolving future.

The 12 meta-skills are grouped into three categories: self-management, social intelligence, and innovation.

Self-management	Social intelligence	Innovation
Focusing	Communicating	Curiosity
Integrity	Feeling	Creativity
Adapting	Collaborating	Sense-making
Initiative	Leading	Critical thinking

Adapted from: Skills 4.0: A skills model to drive Scotland's future, Centre for Work-based Learning in Scotland, (2018).

You should:

- make learners aware that meta-skills are generic and transferable across many different contexts
- support learners to focus on the meta-skills that they find most relevant by encouraging an individualised, active learning approach that relates to the industry and sector contexts of this data science qualification
- help learners to understand key meta-skills for the data science sector and any other personally important meta-skills, and set development goals for these
- encourage learners to focus on reflective practice.

None of the meta-skills are mandatory.

Learning and teaching

You can introduce meta-skills to learners as tools they can use in response to real-world challenges and opportunities. At SCQF level 8, you should use terminology from the Skills 4.0 model, but it is important that you develop a shared understanding with learners about
meta-skills and what they mean to them, both individually and in the context of coursework, projects and the data science sector.

You should embed meta-skills in learning and project tasks as a context for planning, practice, and reflection. You should encourage learners to be self-aware, set active goals and monitor their progress.

The process of developing meta-skills is not linear and you should make learners active participants in their learning. At the start of the process, you should introduce meta-skills to learners and explore the concept of self-assessment with them. You should set goals and make development and evaluation plans together. The process should become cyclical, with reflective practice informing new self-awareness, goal setting and review.

Many traditional learning and teaching activities used to develop industry or sector-specific skills, knowledge and understanding also support the development of meta-skills. You can map these in course materials and resources and during learning.

Meta-skills are central to successfully engaging with and completing assignments and projects. You should encourage learners to plan how they will use and develop meta-skills in their coursework and to reflect on their success and future goals.

The role of the coach, mentor or facilitator is key to help learners understand, develop and reflect on their own meta-skills and those central to course activities, assessment projects and professional practice in the data science sector. You and any employer partners or guest speakers could guide learners by taking on a coaching and mentoring role.

In this role, you should introduce learners to the fundamentals of reflective practice. You could use several models of reflective practice. You do not need to use a theoretical perspective. Any reference to these models should support learners' understanding of the nature and value of reflective practice in self-understanding and making change.

Introducing reflective practice can support your learners' personal development and goal setting. Frequent formative peer-to-peer, assessor, client (if appropriate) and group reflection activity can support learners through reflective practice.

Learners can focus on any meta-skills appropriate to them and their context. However, learning and teaching should also facilitate individual development. Learners have individual strengths and areas for development and they do not have to reach a particular level in relation to meta-skills. Coursework and projects provide the context for development appropriate to the SCQF level. Within these contexts, the **process** of development is important. You should create a clear learning plan with each learner to provide evidence of their development.

You can create descriptions of abilities and skills that relate to meta-skills with your learners. These can come from self-profiling, exploring the industry and sector, and discussion with peers and employers. You should consider the meta-skills needed to complete coursework and meet personal goals to set a context for reflection.

Exploring learning and working styles, personality traits and preferences, personal profiling and self-assessment tools can help learners to develop an understanding of their strengths and areas for development.

You can use case studies and scenario-based activities to demonstrate the value of meta-skills and how they can be applied. You can provide opportunities for peer reflection. A group of learners could share experiences and reflections about how to apply meta-skills in the context of their coursework. You could adopt the role of facilitator to draw learners' attention to situations where meta-skills were or could have been applied.

Reflective discussions can focus on how and where meta-skills are being developed. Your discussions with learners could include positive recognition and guidance on future development based on previous performance. As learners progress, you could introduce industry content that requires skills like problem recognition and problem solving, both of which combine multiple meta-skills.

You can deliver the knowledge and skills for practical aspects of projects in sequence. However, learners benefit from learning and teaching that integrates meta-skills with project planning and development. This approach supports learners to engage in reflective practice throughout the project and develops their self-awareness and an appreciation for continuous learning. It also maximises your opportunities to support, coach and mentor learners through their projects.

Learning for Sustainability

Context

The UN 2030 Agenda for Sustainable Development, adopted by the UK in 2015, has shaped the development of internal and national sustainability policy. It sets out the [United Nations Sustainable Development Goals](#) (SDGs), which are central to the Scottish Government's [National Performance Framework](#). Learning for Sustainability (LfS) is a commitment to embedding the SDGs in Scottish education.

In line with this, SQA is committed to incorporating the skills, knowledge, understanding and values of LfS within all new and revised qualifications.

LfS combines:

- education on sustainable development (ESD)
- global citizenship
- outdoor learning

ESD is the internationally used term for sustainability education. LfS has a broader remit; however, the terms are largely interchangeable. ESD tends to be used by colleges and universities, while LfS is usually used in schools. Both focus on a broad range of social, economic and environmental themes and approaches across all levels of education. SQA uses LfS as an umbrella term.

LfS is designed to nurture a generation of learners who know the value of the natural world and are committed to the principles of social justice, human rights, global citizenship, democratic participation and living within the ecological limits of the planet. It aims to respond to global challenges by developing learners' skills, knowledge, understanding and values relating to sustainability so they can interact with the world in a socially responsible way.

LfS is more than the sum of its parts; it is about building learners' capacity to deal with the unpredictable challenges facing our rapidly changing world. It encourages transformational change through learning, by which learners are able to critically analyse, communicate and collaborate on complex social, environmental and economic challenges. This gives learners increased confidence, opportunities to develop a range of meta-skills, and enhanced motivation and readiness to learn.

Learning for Sustainability in Next Generation Higher National Qualifications

Next Generation Higher National (NextGen: HN) qualifications have been developed with sustainability as a core component.

All NextGen: HN learners should exit their qualification with:

- a general understanding of sustainability and the SDGs
- an understanding of subject-specific sustainability issues, how these relate to the SDGs, and potential improvements
- the confidence to apply their knowledge and skills in the next stage of their lives

Central to these aims is a need for familiarity with both the SDGs and the concept of sustainability (which is the need to ensure a balance between economic growth, environmental stewardship and social well-being). Knowledge and understanding of current industry practices and behaviours, and consideration of how these could be made more sustainable and contribute towards the SDGs, are integral in developing young people to be responsible and empowered citizens who are able to contribute to building a socially just, sustainable and equitable society.

With this in mind, sustainability is embedded as an outcome in Professional Practice in Data Science at SCQF level 8.

By completing this outcome, learners develop skills, including the abilities to:

- assess their own knowledge and understanding of sustainability and the SDGs
- review unit content against the SDGs to identify a sustainability-related issue
- apply knowledge and understanding of sustainability and the SDGs to propose improvements

Any of the SDGs can be covered; there are none that are mandatory.

Grading

Please see the Grading Pack for this qualification for more information on grading.

Learners who pass NextGen: HN qualifications receive one of the following grade outcomes for the qualification as a whole:

- Achieved with Distinction
- Achieved with Merit
- Achieved

You assess and judge each learner's performance across the **key competences** of the group award to determine their whole-qualification grade. You must align judgements with the whole-qualification grade descriptors, which are:

Achieved with Distinction

This candidate consistently demonstrates outstanding knowledge, understanding and application of skills. Thinking and working independently to an exceptional standard, they apply excellent judgement and creative problem-solving skills. They achieve or exceed agreed aims by confidently applying an extensive range of meta-skills and working very effectively with colleagues and peers.

Achieved with Merit

This candidate demonstrates an excellent level of knowledge, understanding and application of skills. Thinking and working independently to a high standard, they demonstrate good judgement and effective problem-solving skills. They achieve agreed aims by applying a broad range of meta-skills and working effectively with colleagues and peers.

Achieved

This candidate demonstrates thorough knowledge, understanding and application of skills. They think and work independently and use their judgement to find solutions to problems. They achieve agreed aims by applying a range of meta-skills and working well with colleagues and peers.

Successful learners receive their grade, along with the grade descriptor text, on their commemorative certificate.

In addition, you assess individual units on a pass or fail basis. Each unit has evidence requirements that learners must achieve before you can consider them for whole-qualification grading.

Grading and meta-skills

Meta-skills are a key part of the NextGen: HN qualifications and learners develop them throughout the group award. Competence in individual meta-skills is not assessed or graded. For example, the qualification does not judge the quality of learners' feeling or creativity, or their specific progress in any given meta-skill. Rather, it is the process of development the learner goes through that contributes to the whole-qualification judgement. This means learners should provide evidence of planning, developing and reflecting on their meta-skills. The grading matrix includes criteria on meta-skills, which you should use to support this judgement. See the NextGen: HN Meta-skills, Outcome and Assessment Guidance document for support with assessing meta-skills development.

How the group award meets employer needs

This group award is designed in collaboration with employers to meet the sector need for data science practitioners. The following tables show how the group award can benefit employers by producing learners with the necessary skill set.

Table 1 shows how units map to the aims of the group award. Table 2 shows how the units map to National Occupational Standards. Table 3 shows the significant opportunities that the group award provides for learners to develop more generic skills and meta-skills. Table 4 shows the assessment strategy for the group award.

Table 1(a): Mapping group award aims to units

General aims

Key: Aim is relevant to unit (X)   Aim is not as relevant to unit (—)

Unit code	Unit title	General aims 1	General aims 2	General aims 3	General aims 4	General aims 5	General aims 6
J6C9 48	Agile Project Management	—	X	X	X	—	—
J6CA 48	Artificial Intelligence	X	X	—	X	X	—
J6CB 48	Big Data	X	X	X	X	X	X
J6CC 48	Cloud Computing	X	X	X	X	—	—
J6CD 48	Data Engineering	X	X	X	X	X	—
J6CL 49	Data Engineering	X	X	X	X	X	—
J6CE 48	Data Flow	—	X	X	X	—	—
J6CM 48	Data Management	X	X	X	X	X	X
J6C5 48	Data Science	X	—	X	X	X	X
J6CF 48	Data Visualisation	—	X	X	X	X	X
J6CN 48	Machine Learning	X	X	X	X	X	—
J6CP 49	Machine Learning	X	X	X	X	X	—
J6CH 48	Mathematics for Data	X	—	X	X	—	—
J6CJ 48	NoSQL Databases	—	X	X	X	X	—

Unit code	Unit title	General aims 1	General aims 2	General aims 3	General aims 4	General aims 5	General aims 6
J6CK 48	Probability and Statistics in Data Science	X	—	X	X	—	—
J6C6 48	Professional Practice in Data Science	X	X	X	X	X	X

Table 1(b): Mapping group award aims to units

Specific aims

Key: Aim is relevant to unit (X)   Aim is not as relevant to unit (—)

Unit code	Unit title	Specific aims 1	Specific aims 2	Specific aims 3	Specific aims 4	Specific aims 5	Specific aims 6	Specific aims 7	Specific aims 8	Specific aims 9	Specific aims 10
J6C9 48	Agile Project Management	X	—	—	—	—	—	—	—	—	X
J6CA 48	Artificial Intelligence	—	X	X	X	—	X	X	X	—	—
J6CB 48	Big Data	—	X	X	X	X	X	X	X	—	X
J6CC 48	Cloud Computing	—	—	—	—	—	—	X	—	X	—
J6CD 48	Data Engineering	X	X	X	X	X	X	X	X	X	—
J6CL 49	Data Engineering	X	X	X	X	X	X	X	X	X	X
J6CE 48	Data Flow	—	X	—	—	X	—	X	—	X	—
J6CM 48	Data Management	X	X	X	X	X	—	X	—	X	—
J6C5 48	Data Science	—	X	X	X	X	X	X	X	X	X
J6CF 48	Data Visualisation	X	X	X	X	—	—	X	X	—	—
J6CN 48	Machine Learning	X	X	X	X	X	X	X	X	X	—
J6CP 49	Machine Learning	X	X	X	X	X	X	X	X	X	X
J6CH 48	Mathematics for Data	—	—	—	—	—	X	X	—	—	—

Unit code	Unit title	Specific aims 1	Specific aims 2	Specific aims 3	Specific aims 4	Specific aims 5	Specific aims 6	Specific aims 7	Specific aims 8	Specific aims 9	Specific aims 10
J6CJ 48	NoSQL Databases	—	—	—	—	X	—	X	X	X	—
J6CK 48	Probability and Statistics in Data Science	X	X	—	X	X	X	X	—	—	—
J6C6 48	Professional Practice in Data Science	X	X	X	X	X	X	X	X	X	X

Table 2: Mapping National Occupational Standards (NOS) to units

The NOS for Information Technology (IT) Professionals are designed at 4 levels, from 3 to 6. Level 3 applies to IT professionals in the first two years of employment and corresponds well to the level of knowledge and skills in HND Data Science.

NOS Subdiscipline: IT Professional (Data Science) level 3

These units are related to the following National Occupational Standards:

- ESKITP801301: Assist in Delivering the Data Management Infrastructure to Support Data Analysis and Reporting
- ESKITP802301: Assist in Delivering Routine Data Analysis Studies
- ESKITP803301: Assist in Delivering Data Driven Business Insights
- TECIS804301: Assist in the Deployment of Artificial Intelligence Solutions
- TECIS805301: Assist in Developing and Validating Machine Learning Solutions

Key: Mandatory (M)   Optional (O)
        Aim is relevant to unit (X)   Aim is not as relevant to unit (—)

Unit code	Unit title	Data Management (ESKITP801301)	Data Analysis (ESKITP802301)	Data Science (ESKITP803301)	Artificial Intelligence (AI) (TECIS804301)	Machine Learning (TECIS805301)
J6C5 48	Data Science (M)	X	X	X	—	—
J6C6 48	Professional Practice in Data Science (M)	X	X	X	X	X
J6C9 48	Agile Project Management (O)	—	X	X	—	—
J6CA 48	Artificial Intelligence (O)	—	—	—	X	X
J6CB 48	Big Data (O)	X	—	X	—	—

Unit code	Unit title	Data Management (ESKITP801301)	Data Analysis (ESKITP802301)	Data Science (ESKITP803301)	Artificial Intelligence (AI) (TECIS804301)	Machine Learning (TECIS805301)
J6CC 48	Cloud Computing (O)	X	—	—	—	X
J6CE 48	Data Flow (O)	X	—	X	—	—
J6CF 48	Data Visualisation (O)	X	X	X	—	X
J6CH 48	Mathematics for Data (O)	—	—	—	X	X
J6CJ 48	NoSQL Databases (O)	X	X	X	—	—
J6CK 48	Probability and Statistics in Data Science (O)	—	X	X	—	X
J6CD 48	Data Engineering (O)	X	X	X	—	X
J6CL 49	Data Engineering (O)	X	X	X	—	X
J6CM 48	Data Management (O)	X	—	—	—	—
J6CN 48	Machine Learning (O)	X	—	X	—	X
J6CP 49	Machine Learning (O)	X	—	X	—	X

Tables 3(a), (b) and (c): Mapping opportunities to develop meta-skills across the group award

Table 3(a): Self-management

Unit code	Unit title	Meta-skills
J6CD 48	Data Engineering	• Focusing
J6CK 48	Probability and Statistics in Data Science	• Focusing
J6C5 48	Data Science	• Focusing • Integrity
J6CF 48	Data Visualisation	• Integrity
J6C6 48	Professional Practice in Data Science	• Focusing • Integrity • Adapting
J6CJ 48	NoSQL Databases	• Adapting
J6CD 48	Professional Practice in Data Science	• Focusing • Initiative
J6CN 48	Machine Learning	• Initiative
J6CD 48	Data Engineering	• Adapting • Initiative
J6C9 48	Agile Project management	• Adapting • Initiative

Table 3(b): Social intelligence

Unit code	Unit title	Meta-skills
J6C6 48	Professional Practice in Data Science	• Communication • Feeling • Collaborating
J6CF 48	Data Visualisation	• Communication
J6CA 48	Artificial Intelligence	• Communication
J6CN 48	Machine Learning	• Communication
J6C9 48	Agile Project Management	• Feeling
J6CD 48	Data Engineering	• Leading
J6CJ 48	NoSQL Databases	• Leading
J6C5 48	Data Science	• Leading

Table 3(c): Innovation

Unit code	Unit title	Meta-skills
J6C6 48	Professional Practice in Data Science	• Curiosity • Creativity • Sense-making • Critical thinking
J6CB 48	Big Data	• Curiosity
J6CA 48	Artificial Intelligence	• Curiosity
J6CF 48	Data Visualisation	• Curiosity • Creativity • Sense-making
J6CJ 48	NoSQL Databases	• Creativity
J6CK 48	Probability and Statistics in Data Science	• Sense-making • Critical thinking
J6CH 48	Mathematics for Data	• Sense-making • Critical thinking
J6CD 48	Data Engineering	• Critical thinking
J6CN 48	Machine Learning	• Critical thinking

Table 4: Assessment strategy for the group award

Unit code	Unit title	Assessment method
J6C5 48	Data Science	• Knowledge evidence: Sampling frame specified • Product evidence: Analysis and program code for data science methods applied to a dataset

J6C6 48	Professional Practice in Data Science	• Product evidence:
		  ○ report on a large data science project
		  ○ individual self-evaluation report
		  ○ meta-skills report
		• Performance evidence: Team presentation of a project and demonstration of a solution

J6C9 48	Agile Project Management	• Product evidence (at least one project)
J6CA 48	Artificial Intelligence	• Knowledge evidence: Sampling allowed (not specified) • Product evidence: Analysis of a large dataset
J6CB 48	Big Data	• Knowledge evidence: Investigative report • Product evidence: Analysis of a large dataset
J6CC 48	Cloud Computing	• Knowledge evidence: No sampling • Product evidence: Practical assignments on cloud infrastructure
J6CE 48	Data Flow	• Product evidence: Portfolio of assignments in data flow analysis
J6CF 48	Data Visualisation	• Knowledge evidence: No sampling • Product evidence: Application of data management to a given problem
J6CH 48	Mathematics for Data	• Knowledge evidence: Sampling allowed (not specified)

Unit code	Unit title	Assessment method
J6CJ 48	NoSQL Databases	• Knowledge evidence: No sampling • Product evidence: Practical assignments in NoSQL databases
J6CK 48	Probability and Statistics in Data Science	• Knowledge evidence: No sampling • Product evidence: Source code and documentation used to analyse a dataset
J6CD 48	Data Engineering	• Knowledge evidence: Sampling allowed (not specified) • Product evidence: Apply data engineering to solve a data problem
J6CL 49	Data Engineering	• Knowledge evidence: Sampling frame specified • Product evidence: Apply data engineering to solve a complex data problem
J6CM 48	Data Management	• Knowledge evidence: No sampling • Product evidence: Application of data management to a given problem
J6CN 48	Machine Learning	• Knowledge evidence: Sampling frame specified • Product evidence: Program code to implement a machine learning model
J6CP 49	Machine Learning	• Knowledge evidence: Sampling frame specified

Approaches to delivery and assessment

You should prioritise the Data Science unit and deliver it as early as possible in the course. It provides the underpinning for many optional units, such as Machine Learning at SCQF level 7 and Data Management at SCQF level 7. You should deliver the mandatory project unit (Professional Practice in Data Science) when learners have sufficient breadth of knowledge in their optional topics to apply the concepts, principles and skills acquired in them to solve a significantly large and complex data science project.

You should consider where you can integrate delivery of units to enhance learning, or where sequential delivery might provide the best learning opportunity. In all the units in this HND, your approach should help learners to realise the data science concepts through practical experiences with real-world datasets. The more realistic the data, the more powerful the learning experience. There are many sources for datasets that are suitable for introducing concepts of data management, transformation and analysis. The increasing availability of open-source data from governments and their agencies opens up scope to challenge learners to apply their knowledge and skills to unfamiliar contexts.

Many of the HND Data Science units are suited to assessment in the form of assignments and/or projects. In such cases, the product evidence is clearly specified, and you should use this information to plan work that enables learners to meet the evidence requirements. The case studies and assignments used for the purpose of generating assessment evidence should be as authentic as possible, while considering the SCQF level of the unit. You should change the datasets used for assessment at regular intervals. Where program code is required, you should ensure that learners have sufficient access to programming resources, such as integrated development environments (IDEs) or notebook-style environments.

The SDGs represent one of the greatest data challenges of our age. In addition to reporting, data can help us to achieve SDGs by driving policy changes. Data science allows us to draw insight from novel data sources, and improve methods that we can share and reuse.

The Office for National Statistics (ONS) in the UK has established a Data Science Campus with the aim of applying data science for public good. Its Open SDG platform enables governments to visualise the reporting status of their SDGs (244 indicators across 17 goals).

Data science is having a profound impact in the areas of commerce, health and smart cities. It can have an equal if not greater impact in the area of earth and environmental sciences, offering new techniques to support both a deeper understanding of the natural environment in all its complexities, and the development of well-founded mitigation and adaptation strategies in the face of climate change.

Data science and analytics have a key role to play in achieving many of the UN SDGs. They can be leveraged to enable sustainable development, particularly measuring impact, managing resources and tackling climate change. Data science

can help lower-income countries and emerging economies build data systems that contain information about households, occupations and wages. This helps them to inform policy decisions, target investments and optimise budgets.

In terms of achieving quality education goals, data science can improve education through evidence-based standards and targeted interventions. Data science contributes to more sustainable approaches to energy creation through smart grids and dynamic energy management.

The use of image recognition in the sorting of recycling waste contributes to the achievement of clean water and sanitation goals. The applications of data science to agriculture, microbiology, the identification and treatment of health issues, finance, traffic management and so on are many and varied, and you should not overlook the relationship of these applications to the achievement of SDGs in the delivery of this qualification.

Sequencing or integrating units

Some units can be integrated to enhance the learning experience. Typical examples could be:

- Data Engineering and Cloud Computing
- Data Management and NoSQL Databases
- Machine Learning, and Probability and Statistics for Data Science

An alternative approach to sequencing units is to base them on the sequence of actions in a typical data science problem. This is represented below:

1 data requirement gathering
2 data collection
3 data cleaning and transformation
4 data analysis
5 data interpretation
6 data visualisation

Additional guidance on integrated or holistic assessment

Holistic or integrated assessment focuses on assessing a number of outcomes in a unit together, or in some cases the whole unit, rather than specific outcomes. When assessing a unit of competence holistically, the assessment activities integrate a number of aspects of the competence. Holistic or integrated assessment can reduce the time spent on assessment and can promote greater equity in the assessment process.

When developing or revising a Higher National Qualification, SQA works with a development team to devise an appropriate assessment strategy that accommodates holistic or integrated assessment. However, the practice of integrating units for the purposes of learning and teaching is a centre-led activity.

Units are designed to facilitate holistic or integrated assessment approaches that prevent large, unwieldy instruments of assessment.

Sometimes more than one piece of evidence is needed for a unit. For example, if a unit is about data visualisation, a learner would need to produce evidence of performance (following the correct procedures and processes when analysing the data and building the visualisation) and product (the final visualisation).

Evidence requirements must do what they say: specify requirements for evidence of learner competence in the unit. The evidence must be of sufficient quality for an assessor or verifier to judge that the learner has achieved the unit.

Assessing project units

The Professional Practice in Data Science unit comprises a data science project that is sufficiently large or complex to require its analysis and solution to be carried out by a project team. You organise your group into teams of three to five learners, taking into account the preferences they express in relation to the available projects and your judgement of an appropriate composition for each team. Teams should vary in terms of age, gender, and ability.

You should have a range of data science projects that would be suitable to enable demonstration of the outcomes of the project unit. You should select these to be as authentic (real-world) as possible and aligned to the level of study required. The projects should allow learners to draw on the range of outcomes in their HN qualification and help them to develop their meta-skills while engaging in the project. To standardise the learner experience and level of demand, you should use a template to describe the objectives and required outcomes for each project.

You should:

- approve projects
- assign learners to teams
- ensure each team allocates roles at the start of the project
- receive briefings from each team on their progress against milestones
- observe and record the contributions of individual learners to teamwork and solution
- arrange for the presentation of the project outcomes and solution
- intervene to guide and support learners when required

You should approach your role with a light touch, leaving each team to make their own decisions about a project methodology, as well as roles, timelines, resource allocations and meetings. We recommend that each learner leads a specific part of the project (assuming a role such as lead data analyst or lead tester).

The product evidence is a digital product that addresses a real-world problem for a business or organisation. It must be sufficiently complex to require formal project management and development approaches. Each project team must collectively produce items 1 to 5 below and each learner must individually produce item 6. Learners must provide the following product evidence:

1   the project plan, based on requirements-gathering and analysis
2   the digital solution to the problem
3   a project report (including project evaluation)
4   documentation of the product (technical and user)
5   presentation of the project outcomes and demonstration of solution
6   personal statement

The digital product must provide a working solution that meets the requirements set out in the project plan. The learner's personal statements must:

- describe their specific role or roles in the project team
- include a self-evaluation of their contribution to the development of the digital product

The performance evidence is in two parts:

- a record of the learner's professional behaviours and contributions to the project; this may be in the form of a checklist
- a recording of their presentation

Each learner must make an identifiable contribution to the final presentation of the project outcomes and the demonstration of the solution. The contribution can be in any form that is appropriate and agreed with the assessor.

Opportunities for e-assessment

Assessment that is supported by information and communication technology (ICT), such as e-testing or the use of e-portfolios or social software, may be appropriate for some assessments in this unit.

If you want to use e-assessment, you must ensure that you apply the national standard to all evidence and that conditions of assessment (as specified in the evidence requirements) are met, regardless of the mode of gathering evidence.

Learners need to use software products for most of the assessments that require product evidence. This results in a high proportion of digital evidence, which can be gathered in an
e-portfolio.

Where knowledge evidence is required, it can often be generated in digital form, such as text documents, slide decks, audio files and video recordings. Where testing is used, you should adopt online approaches to tests where practicable.

Draft

Remediation and re-assessment in Next Generation Higher National Qualifications

Remediation

Remediation allows an assessor to clarify learners' responses, either by requiring a written amendment or by oral questioning, where there is a minor shortfall or omission in evidence requirements. In either case, the assessor must formally note such instances, in writing or as a recording, and make them available to the internal and external verifier.

Remediation is not permitted for closed-book assessments.

The size and structure of the larger NextGen: HN units should mean that the assessor or lecturer is close enough to ongoing assessment activity in project-based units to identify the need for remediation as it occurs.

Re-assessment

We must give learners who fail the unit a re-assessment opportunity or, in exceptional circumstances, two re-assessment opportunities. Where we have introduced larger units to the framework, we expect instances of re-assessment to be minimal, due to the approach to assessment and remediation. Where re-assessment is required in a project-based unit, you must use a substantially different project.

Resource requirements

The resource requirements for HND Data Science are dependent on the optional units chosen. For example, the optional unit Cloud Computing requires access to cloud infrastructure and user accounts with a cloud service provider. You can find resource requirements in the unit specifications.

The mandatory units require access to computing resources that support the range of software products used in the acquisition, cleaning, transformation, analysis and visualisation of data. Where program code is to be developed, learners should have access to appropriate IDEs and code libraries. We also recommend that they have access to a notebook-style environment.

Above all, this qualification depends upon good quality, real-world datasets for both learning and assessment. There are a range of sources of such datasets, including open-source datasets from governments and their agencies.

Information for centres

Equality and inclusion

The units in this group award are designed to be as fair and as accessible as possible, with no unnecessary barriers to learning or assessment.

You should take into account the needs of individual learners when planning learning experiences, selecting assessment methods, or considering alternative evidence.

Guidance on assessment arrangements for disabled learners and/or those with additional support needs is available on the assessment arrangements web page.

Internal and external verification

All instruments of assessment used in this qualification should be internally verified according to your centre's policies and SQA's guidelines.

SQA carries out external verification to ensure that internal assessment meets the national guidelines for this qualification.

Further information on internal and external verification is available in SQA's Guide to Assessment.

Glossary

SQA credit value: the credit value allocated to a unit gives an indication of the contribution the unit makes to an SQA group award. An SQA credit value of 1 represents approximately 40 hours of programmed learning, teaching, and assessment.

SCQF: the Scottish Credit and Qualifications Framework (SCQF) provides the national common framework for describing programmes of learning and qualifications in Scotland. SCQF terminology is used throughout this guide to refer to credits and levels. For further information on the SCQF, visit the SCQF website.

SCQF credit points: SCQF credit points provide a way of describing and comparing the amount of learning required to complete a qualification at a given level of the framework.
1 National Unit credit is equivalent to 6 SCQF credit points. 1 National Unit credit at Advanced Higher and 1 SQA Advanced unit credit (irrespective of level) is equivalent to 8 SCQF credit points.

SCQF levels: the level a qualification is assigned in the framework is an indication of how hard it is to achieve. The SCQF covers 12 levels of learning. SQA Advanced Certificates and SQA Advanced Diplomas are available at SCQF levels 7 and 8, respectively. SQA Advanced units are usually at levels 6 to 9 and graded units at level 7 and 8. National Qualification Group Awards are available at SCQF levels 2 to 6 and are usually made up of National Units, which are available from SCQF levels 2 to 7.

Information for learners

HND Data Science at SCQF level 8

This information explains:

- what the qualification is about
- what you should know or be able to do before you start
- what you will need to do during the qualification
- opportunities for further learning and employment

Group award information

The HND Data Science qualification provides you with the knowledge, understanding and skills that you need to pursue a career in data science and to progress to higher levels of attainment in data science. You gain competence in accurately formulating a data question, carrying out reproducible analysis on large datasets and presenting findings in an actionable format.

During the qualification you develop competence in locating and accessing data sources and transforming data for analysis. You understand the techniques for analysis of data, including the tools and models that you use to analyse data, and visualise and communicate your conclusions. You participate in a large project, applying project management approaches to develop a team solution to a data problem. In this project, you manage data assets and plan for data analysis. The qualification affords you scope to develop a sense of professionalism in data science, as well as the opportunity to develop meta-skills in self-management, social intelligence and innovation.

You are assessed in this award through a variety of approaches that reflect modern practice in assessment, including the use of projects, assignments, and question papers. You are encouraged to use a range of media to present evidence, such as video, audio, web pages and social media platforms.

Your final award (provided all units are passed) is graded in a manner that reflects the quality of your work over the course. Project work that you have completed in the units of the course is graded according to a set of criteria that relate to the competences expected of a data science practitioner.

HND Data Science aims to provide you with a solid foundation of knowledge and skills that enable you to gather and use data to uncover patterns and trends, build models to make predictions for the future, and support decision making.

The specific aims of this qualification are to:

- develop analysis and communication skills necessary for a data professional role
- develop skills in locating, accessing and combining data sources and inspecting, cleansing and transforming data for analysis purposes
- instil adherence to regulatory, legal, ethical and governance standards when working with data
- demonstrate how data and analysis may exhibit biases and prejudice and how to mitigate risks
- develop an understanding of the data life cycle and the steps involved in data analysis tasks
- develop an understanding of mathematical, statistical and computational data modelling techniques
- demonstrate tools and techniques available for data analysis, including programming languages and notebooks, packages and visualisation aids
- exemplify the analysis of large and/or complex datasets to create data models, visualisations and dashboards that provide insights and inform decisions
- develop skills in the automation of analysis of large datasets to create a reproducible process
- collaborate in applying data science concepts and methods to analyse large complex datasets and communicate the results

You develop your own meta-skills in a vocational context by planning a strategy for meta-skills development, implementing and reviewing your plans and assessing progress.

Career opportunities include working as a data scientist in the areas of health science, public sector, industry, commerce or entertainment, with an emphasis on algorithm creation and refinement to build better predictive models. In such roles, you extract information and insights from large data sets to understand the past and current performances of an organisation, make informed decisions, and predict future trends.

You also gain the knowledge and skills to proceed to degree-level qualifications in data science or in other aspects of computer science.

Administrative information

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History of changes

Version	Description of change	Date

Note: please check [SQA's website](#) to ensure you are using the most up-to-date version of this guide, and check SQA's APS Navigator to ensure you are using the most up-to-date qualification structure.

If a unit is revised:

- no new centres can be approved to offer the previous version of the unit
- centres should only enter learners for the previous version of the unit if they can complete it before its finish date

For further information on SQA's Next Generation Higher National Qualifications please contact nextgen@sqa.org.uk.