Course Support Notes

National 3 Computing Science Course Support Notes

Please refer to the note of changes at the end of this template for details of changes from previous version (where applicable).

Contents

Introduction

These support notes are not mandatory. They provide advice and guidance on approaches to delivering and assessing the National 3 Computing Science Course. They are intended for teachers and lecturers who are delivering the Course and its Units. They should be read in conjunction with the *Course Specification* and the Unit Specifications for the Units in the Course.

General guidance on the Course

Aims

As stated in the *Course Specification,* the aims of the Course are to enable learners to:

- introduce and develop aspects of computational thinking in a range of contexts
- develop knowledge and understanding of basic facts and ideas in computing science
- develop skills and knowledge in software and application-based development tools
- apply skills and knowledge to develop and implement simple digital solutions

Progression into this Course

Entry to this Course is at the discretion of the centre. However, learners would normally be expected to have attained some relevant skills and knowledge through prior experience. Skills and knowledge developed through any of the following, while not mandatory, are likely to be helpful as a basis for further learning in this Course

SQA qualifications

- National 2 Information and Communication Technology Course

Other experience

Learners may also have relevant skills and knowledge gained through other education systems or from their own interests and informal learning.

Skills, knowledge and understanding covered in this Course

This section provides further advice and guidance about skills, knowledge and understanding that could be included in the Course.

The skills and knowledge will be developed throughout the Course. The table below shows where there are significant opportunities to develop these in the individual Units.

Skills and knowledge	**Building Digital Solutions**	**Information Solutions**
applying, with guidance, aspects of computational thinking across a range of simple contexts	✓	✓
analysing, with guidance, simple problems within computing science across a range of contemporary contexts	✓	✓
creating, implementing and testing, with guidance, digital solutions to simple problems across a range of contemporary contexts	✓	
using a range of tools and applications to create, populate and maintain information		✓
basic knowledge of key facts and ideas related to building digital solutions and information solutions	✓	✓

Teachers/lecturers should ensure that learners are fully aware of the wide range of skills, knowledge and understanding that they are developing in the Units and Course as a whole.

It is also important to highlight any transferable learning that is taking place which supports the development of skills for learning, skills for life and skills for work.

Progression from this Course

This Course or its Units may provide progression to:

- National 4 Computing Science Course or relevant Units
- National Progression Awards in Computing, IT and related areas
- Skills for Work Courses in Creative Digital Media
- A range of other technological Courses at National 3

and ultimately, for some, to:

- National Certificate Group Awards (NCGA) in computing
- further employment, apprenticeships and/or training
- National 5 Computing Science Course or relevant Units

Hierarchies

Hierarchy is the term used to describe Courses and Units which form a structured progression involving two or more SCQF levels.

This Course is designed to allow learners to progress to National 4 Computing Science although there is no direct hierarchy between the National 3 and National 4 Computing Science Courses. However, there is a fall-back arrangement. This means that a National 4 learner who gains the two Units of the National 4 Course, but fails the Added Value Unit, may be awarded the National 3 Computing Science Course, provided they have achieved the Outcomes and Assessment Standards and been entered for the National 3 Course.

National 4 Units	Software Design and Development	Information System Design and Development
National 3 Units	Building Digital Solutions	Information Solutions

It is important that any content in a Course and/or Unit at one particular SCQF level is not repeated if a learner progresses to the next level of the hierarchy. The skills and knowledge should be able to be applied to new content and contexts to enrich the learning experience. This is for centres to manage.

Approaches to learning and teaching

Computing Science, like all new and revised National Courses, has been developed to reflect Curriculum for Excellence values, purposes and principles.

The approach to learning and teaching developed by individual centres should reflect these principles. Learning in this Course should be practical, enjoyable and experiential in nature. Learners should be encouraged to participate fully in active learning and practical activities by working together, talking and listening while the teacher acts increasingly as a facilitator.

An appropriate balance of teaching methodologies should be used in the delivery of the Course and a variety of active learning approaches is encouraged, including the following:

Activity-based approaches
Whole-class, direct teaching opportunities should be balanced by activity-based learning on practical tasks. An investigatory approach is encouraged, with learners actively involved in developing their skills, knowledge and understanding by investigating a range of real-life and relevant problems and solutions related to real-life digital applications. Learning should be supported by appropriate practical activities, so that skills are developed simultaneously with knowledge and understanding and to provide opportunities for evidence for assessment to be naturally occurring.

Learning about Scotland and Scottish culture will enrich the learners' learning experience and help them to develop the skills for learning, life and work they will need to prepare them for taking their place in a diverse, inclusive and participative Scotland and beyond. Where there are opportunities to contextualise approaches to learning and teaching to Scottish contexts, teachers and lecturers should consider this.

Group work
Practical activities and investigations lend themselves to group work, and this should be encouraged. Learners engaged in collaborative group work strategies can capitalise on one another's knowledge, resources and skills by questioning, investigating, reviewing and presenting ideas to one another. While "working as a team" is not specifically identified as one of the skills for life, learning and work for this Course and therefore not assessed, it is a fundamental aspect of working in the IT and related industries and so should be encouraged and developed by teachers.

Problem-based learning
Problem-based learning (PBL) is another strategy which will support a learner's progress through this Course. This method may be best utilised at the end of an Outcome or a topic where additional challenge is required to ensure learners are secure in their knowledge and understanding and to develop the ability to apply knowledge and skills in less familiar contexts. Learning through PBL develops a learner's problem-solving, decision making, investigative skills, creative thinking, team working and evaluative skills, and is appropriate in any of the Units of this Course.

Computational thinking
Computational thinking is recognised as a key skill set for all 21st century learners — whether they intend to continue with computing science or not. It involves a set of problem-solving skills and techniques that software developers use to develop digital solutions and these can be applied at any level. They include:

- **Abstraction:** seeing a problem and its solution at different levels of detail.
- **Algorithms:** step-by-step strategies for solving a problem.
- **Decomposition:** breaking down a task into smaller sub-tasks.
- **Pattern recognition:** noticing similarities and using these to help solve problems.
- **Generalisation:** realising that a solution to one problem may be used to solve a whole range of related problems.

Underpinning all of these concepts is the idea that computers are **deterministic**: they do exactly what you tell them to do.

While computational thinking can be a component of many subjects, Computing Science is particularly well-placed to deliver it. Teachers are encouraged to emphasise, exemplify and make these aspects of computational thinking explicit (at an appropriate level) wherever there are opportunities to do so throughout the teaching and learning of this Course and its Units.

Using online resources
Throughout the teaching of this Course, the stimulation of learners' interest and curiosity should be a prime objective. Online resources, such as those listed in the individual *Unit Support Notes* may provide a valuable addition to teaching and learning activities, encouraging research, collation and storage of information and evaluation of these materials. The use of interactive multimedia learning resources, online quizzes, and web-based software can also be used to support teacher-led approaches.

Learning and teaching activities should be designed to develop skills and knowledge to the standard required by each Unit and to the level defined by the associated Outcomes and Assessment Standards.

Assessment activities, used to support learning, may usefully be blended with learning activities throughout the Course, for example by:

- sharing learning intentions/success criteria
- using assessment information to set learning targets and next steps
- adapting teaching and learning activities based on assessment information
- boosting learners' confidence by providing supportive feedback

Self- and peer-assessment techniques should be encouraged wherever appropriate.

Meeting the needs of all learners
In every class, learners will have individual strengths and areas for improvement.

Carefully planned assessment strategies that allow teachers to cater for individual needs by supporting and building upon each individual learner's knowledge, skills and confidence and identifying their next steps can be useful.

It is also possible to support individual learning needs by providing a range of differentiated materials that have an embedded series of examples and problem-solving tasks which progress from the simple to the complex, from the familiar to the unfamiliar.

Sequence of delivery of Units

The sequence of delivery of the Units within the National 3 Computing Science Course is a matter of professional judgement and is at the discretion of the centre.

Units could be delivered in sequence or in parallel. One approach might be to alternate delivery of the Units' content to give variety to teaching and learning activities, e.g. working on web-based information systems alternating with games development software, but other possibilities exist.

Advice on distribution of time

The distribution of time between the various Units is a matter for professional judgement and is entirely at the discretion the centre. Each Unit is likely to require an approximately equal time allocation, although this may depend on the learners' prior learning in the different topic areas.

Resources

Centres may find that existing hardware and software within the Computing Science classroom provides all that is required to deliver the Course. The resources required are summarised below:

- internet-enabled computers and a digital projector
- access to software development tools (appropriate software development environments)
- access to application development software and tools (macro editors, applications that support data handling, presentation, group work, animation, video, graphics and text)
- web development tools (script enabled browsers)
- digital media devices (scanners, digital cameras, camcorders, etc)

Developing skills for learning, skills for life and skills for work

Guidance on the development of skills for life, skills for learning and skills for work is to be found in the support notes for each of the component Units.

Approaches to assessment

To gain the award of the Course, the learner must pass both Units. Units are internally assessed against the requirements shown in each Unit Specification, with further details supplied in the individual *Unit Support Notes.*

Units are assessed on a pass/fail basis within centres. SQA will provide rigorous external quality assurance, including external verification, to ensure assessment judgements are consistent and meet national standards.

Gathering naturally occurring evidence is encouraged and as assessment evidence for this Course may be produced in a variety of electronic or digital formats, including presentations, web pages, blogs, wikis, games, etc these can be stored by the learner (or teacher) within a proprietary e-portfolio, or in a secure folder. Additional e-assessment activities could take the form of online or electronic tests for short answer, multiple choice or true/false scenarios.

See the *Unit Support Notes* for guidance on approaches to assessment of the Units of the Course.

Combining assessment across Units

If an integrated approach to Course delivery is chosen, then there may be opportunities for combining assessment across Units.

Equality and inclusion

The requirement to develop practical skills involving the use of equipment and tools may present challenges for learners with physical or visual impairment. In such cases, reasonable adjustments may be appropriate, including (for example) the use of adapted equipment or alternative assistive technologies. This is for both candidates and centres to consider.

It is recognised that centres have their own duties under equality and other legislation and policy initiatives. The guidance given in these *Course Support Notes* is designed to sit alongside these duties but is specific to the delivery and assessment of the Course.

It is important that centres are aware of and understand SQA's assessment arrangements for disabled learners, and those with additional support needs, when making requests for adjustments to published assessment arrangements. Centres will find more guidance on this in the series of publications on Assessment Arrangements on SQA's website: www.sqa.org.uk/sqa//14977.html.

Appendix 1: Reference documents

The following reference documents will provide useful information and background.

- Assessment Arrangements (for disabled candidates and/or those with additional support needs) — various publications on SQA's website: http://www.sqa.org.uk/sqa/14976.html
- *Building the Curriculum 4: Skills for learning, skills for life and skills for work*
- *Building the Curriculum 5: A framework for assessment*
- Course Specifications
- Design Principles for National Courses
- *Guide to Assessment* (June 2008)
- Overview of Qualification Reports
- *Overview of Qualification Reports*
- *Principles and practice papers for curriculum areas*
- *Research Report 4 — Less is More: Good Practice in Reducing Assessment Time*
- *Coursework Authenticity — a Guide for Teachers and Lecturers*
- *SCQF Handbook: User Guide (published 2009)* and SCQF level descriptors (to be reviewed during 2011 to 2012): www.sqa.org.uk/sqa/4595.html
- *SQA Skills Framework: Skills for Learning, Skills for Life and Skills for Work*
- *Skills for Learning, Skills for Life and Skills for Work: Using the Curriculum Tool*
- SQA Guidelines on e-assessment for Schools
- SQA Guidelines on Online Assessment for Further Education
- SQA e-assessment web page: www.sqa.org.uk/sqa/5606.html

Administrative information

Published: May 2016 (version 1.1)

History of changes to Course Support Notes

Version	Description of change	Authorised by	Date
1.1	Slight amendment to skills and knowledge table to reflect changes made to the Unit Specification.	Qualifications Manager	May 2016

Unit Support Notes

Unit Support Notes — Building Digital Solutions (National 3)

Please refer to the note of changes at the end of this document for details of changes from previous version (where applicable).

Introduction

These support notes are not mandatory. They provide advice and guidance on approaches to delivering and assessing the Building Digital Solutions (National 3) Unit. They are intended for teachers and lecturers who are delivering this Unit. They should be read in conjunction with:

- the Unit Specification
- the Course Specification
- the Course Support Notes
- appropriate assessment support materials

General guidance on the Unit

Aims

The general aim of this Unit, as stated in the *Unit Specification,* is for learners to develop basic knowledge, understanding and practical problem-solving skills in using development software. Learners will develop their practical skills by creating simple digital solutions (such as computer games, animations or applications) using features of development software. Learners will also show they have an understanding of some of the key features of development software.

This Unit will give learners the opportunity to develop their thinking skills and skills in numeracy, employability, enterprise and citizenship.

The Unit can be delivered:

- as a stand-alone Unit
- as a part of the National 3 Computing Science Course

Progression into this Unit

Entry to this Unit is at the discretion of the centre. However learners would normally be expected to have attained some useful skills and knowledge from prior learning within their broad general education or by the following or equivalent qualifications and/or experience:

- National 2 Information and Communication Technology or relevant component Units

In terms of prior learning and experience, relevant experiences and outcomes may also provide an appropriate basis for doing this Unit.

Skills, knowledge and understanding covered in this Unit

Information about skills, knowledge and understanding is given in the National 3 Computing Science *Course Support Notes*.

If this Unit is being delivered on a free-standing basis, teachers and lecturers are free to select the skills, knowledge, understanding and contexts which are most appropriate for delivery in their centres.

Progression from this Unit

On successful completion of this Unit, the following Units and Courses could provide appropriate progression pathways for learners:

- Software Design and Development (National 4) Unit
- National 4 Computing Science Course

- National Certificate Group Awards in a range of Computing and IT disciplines
- National Progression Awards in Digital Media
- Skills for Work Courses in Creative Digital Media

Approaches to learning, teaching and assessment

The Unit is designed to provide flexibility and choice for both the learner and the teacher.

Learning and teaching activities should be designed to stimulate learners' interest, and to develop skills and knowledge to the standard required by the Outcomes and to the level defined by the associated assessment standards.

Tasks and activities throughout the Unit should be linked to relevant contexts.

The Unit and Course Specifications define the skills and knowledge required, but leave complete freedom to the teacher and learner to select interesting contexts in which to develop these. This provides scope for personalisation and choice, as relevant and motivating contexts can be used.

Examples of possible contexts for study could include the development of simple interactive games and quizzes or the development of simple animations and cartoons. The range of suitable contexts is very wide indeed, the only parameters being the need to keep the structure of the game, quiz animation or cartoon simple enough to be realistically achieved within the time frame and skill set appropriate to this Unit.

Interactive games examples could include:

- simple chase games, eg where one sprite chases another across a simple background, with points tallied when the chase is successful
- treasure games where a sprite moves through a series of backgrounds to unearth treasure points
- racing games where you design a track then race against a car driven by the computer

Interactive quizzes can be based on any school subject. Simply structured they can ask a series of questions, check the answers and give simple feedback in text or graphic form.

Simple animations could include:

- a story of a person or an animal (such as a dog, cat or bird) moving across a background, a flower growing, a car moving along a street, a plane flying across a clouded sky

Individual, paired or group problem-solving tasks should be related to such contexts. For example learners could be asked to each create a short animated scene which can then be combined to create a larger animation or cartoon which includes several characters/ sprites and displays text telling a simple story.

The National 3 Computing Science *Course Support Notes* provide further broad guidance on approaches to learning and teaching which may apply to both component Units of the Course, and should be read before delivering this Unit.

Sequence of delivery of Outcomes

The sequence of delivery of the Outcomes and the distribution of time between the Outcomes is a matter for professional judgement and is entirely at the discretion of the centre. Possible approaches are suggested, but other possibilities exist.

Delivering Outcome 1 and Outcome 2 simultaneously

One approach would be to combine the development of knowledge and understanding of the key features of development software at the same time as learners progress through the practical tasks involved in building simple digital solutions.

A useful approach would be to progressively introduce and demonstrate the relevant objects and operations as learners advanced through a series of practical tasks. For example, if using Scratch, the teacher could demonstrate the use of simple standard constructs before setting simple exercises to reinforce the learning, then checking learner's understanding by observation and oral questioning.

Delivering Outcome 1 and Outcome 2 sequentially

It is possible to develop the learner's practical skills in developing simple digital solutions and meet the requirements of Outcome 1 before moving to formally consider some of the key features of development software in Outcome 2. Some learners may benefit from the experience of completing practical exercises before moving to the more theoretical task of identifying the purpose of basic constructs and editing features of their software development software.

Delivering Outcome 2 before Outcome 1

It is also possible to consider the key features of development software and meet the requirements of Outcome 2 before actually carrying out the practical task of building simple digital solutions in Outcome 1.

A useful approach in this instance would be to introduce the key features, objects and menus of a chosen software package and check that learners had grasped their purpose before setting practical exercises. For example, if using Scratch as a development environment, then an introductory demonstration of the key features such as the sprites, costumes, stage, background and the instruction palettes would be appropriate. The teacher then would be tasked with assessing the learner's ability to identify the purpose of basic constructs and identify some of their editing features.

Guidance on multi-level delivery

This Unit is not in direct hierarchy with any other Units at National 4 or National 2 level. However, it may be used as a fall-back option for learners in a National 4 Computing Science Course who do not achieve the requirements for that Course.

If this Unit is being delivered in a multi-level class then it is important for the teacher to:

- have a clear set of teaching materials developed for each of the levels being delivered
- employ flexible grouping strategies appropriately to enable support to be delivered to groups and individuals where needed
- deploy assessment strategies consistently to ensure progress of all learners
- carefully record the progress of the learners in each group

Useful resources
Although not a definitive list, the following resources may support the delivery of the Building Digital Solutions (National 3) Unit.

Online resources:

Online resources (websites, microsites, wikis, newsfeeds, databases, etc) can provide a valuable source of easily accessible and up-to-date information on a wide range of software development tools and topics.

Some suggested general online resources:

- Technology Student
- Teaching Education Scotland
- Education Scotland
- STEM Central on Education Scotland
- Khan Academy

Some suggested specific online resources:

- Education Scotland Consolarium — there are a number of resources available here for games-based learning, programming and software development activities
- How Stuff Works
- Scratch — Scratch on the MIT website — within this site you can also search for Scratch projects by going to the featured projects area of the Channel section
- Kodu website
- Dynamic Learning
- MonkeyJam PDF tutorial on Brickshelf website — there are a number of tutorials available as pdfs within the gallery sections here
- other tutorials are available on YouTube, including those for *MonkeyJam and Trackmania*
- CS Unplugged — a collection of free learning activities that teach Computer Science through games and puzzles

Approaches to delivering and assessing each Outcome
The learner must demonstrate attainment of **all** of the Outcomes and their associated assessment standards. Assessment must be valid, reliable and fit for purpose.

SQA does not specify the methods of assessment to be used; teachers should determine the most appropriate method for their learners. In many cases, evidence (which may be oral or observational) will be gathered during normal classroom activities, rather than through formal assessment instruments.

Centres are expected to maintain a detailed record of evidence, including oral or observational evidence. Evidence in written or presentation format should be retained by the centre.

All evidence should be gathered under supervised conditions.

In order to ensure that the learner's work is their own, the following strategies are recommended:

- personal interviews with learners where teachers can ask additional questions about the completed work
- asking learners to do an oral presentation on their work
- ensuring learners are clear about acknowledging sources
- using checklists to record the authentication activity

Preparing learners for their assessment activities
In order to ensure that learners are prepared in advance for their assessment activities it is good practice for teachers to make learners aware of the assessment standards required and to provide a range of feedback designed to improve learners knowledge and skills as they progress through the Unit.

It is accepted as good practice that the evidence to meet the Assessment Standards for Outcome 1 and Outcome 2 be generated throughout the Course as an integral part of classroom activities.

Outcome 1

The learner will:

1 Develop simple digital solutions using appropriate development software by:

1.1 Creating a digital solution
1.2 Testing the solution to ensure expected output
1.3 Identifying and rectifying simple errors

Notes on delivery of Outcome 1: Creating a digital solution
It is accepted good practice that learners plan their solution before beginning to implement it. The planning document, *which is not mandatory and not required for assessment*, could take a variety of forms, some examples are:

- a simple written description of the game or animation and the steps and objects involved in creating it
- a simple story board combining text and simple graphics outlining the steps and objects involved in the solution
- a mind map showing the steps and objects involved and how they are linked
- a flow chart or diagram

The decision on which is the most suitable is at the discretion of the centre and may vary according to the software chosen to develop the solution. It even varies from learner to learner depending on their individual skills and abilities.

It is envisaged that, as they progress through the Unit, learners will develop a number of different digital solutions incorporating a progressive series of problem-solving challenges.

A progression of problem-solving exercises should be introduced gradually building the learners' skills and confidence. The table below suggests, as a guideline, a progression of tasks based on the use of Scratch.

Progression		
simple movement of a sprite	combine movement with turns	repetitive movement
simple input and output: using 'Ask and Answer' & 'Say'	combining 'Ask and Answer' & 'Say' and movement with turns	combining 'Ask and Answer' & 'Say' with use of a variable
Pen down select colour draw lines	Pen down select colour draw patterns using turns	Pen down select colour draw patterns using turns and repetitive movement

Testing
Learners should test their solutions to ensure that they work correctly. The type of testing will vary according to the software being used. In some cases it may involve the user inputting some simple data, in others it may involve simply running or previewing, eg an animation created with Scratch.

It is not necessary for learners to produce and retain formal test data.
Learners could be encouraged to use their own test data but it is acceptable for teachers to supply suitable test data if necessary. The teacher should observe the testing process and the consequent rectifying of any errors. This should be recorded on the teacher's observation checklist.

Practical group work
It is possible to organise a practical group project. This does offer its own challenges and the teacher should ensure that:

- each member of a group is involved in the design of the solution and that each group member gets involved in sharing their ideas and opinions before drawing up the group's design for the digital solution
- the work is divided up equally among group members. This may involve assigning each member a distinct role or task
- each individual member's contribution is assessed

For example, learners could be asked to work as a group to design an animated cartoon. Each member could then be tasked with creating a short animated scene which can then be combined to create a larger animation or cartoon which includes several characters/sprites and displays text telling a simple story.

Notes on assessment of Outcome 1
Evidence is only required of one successful example for each assessment standard and can be generated throughout the Unit as an integral part of classroom activities, using a single problem-solving task or by a series of separate activities. It is important to note that:

- any solution retained as evidence should involve a sequence of two or more operations
- the evidence retained should constitute a representative sample of the objects and operations available in the software being used

It is expected that, for each digital solution, the evidence collated consists of:

- a digital copy of the solution
- an observation checklist completed by the teacher detailing the testing and rectification of errors

Storing solutions as evidence
Learners should store their digital solutions in a suitable folder or portfolio from which assessment evidence can be selected.

Outcome 2

The learner will:

2 Consider some of the key features of development software by:

2.1 Identifying the purpose of basic constructs
2.2 Identifying some editing features

Notes on delivery of Outcome 2
It is envisaged that learners will investigate a minimum of two development software environments and should be able to identify some of their key features. The range of software is not defined, allowing personalisation and choice and the selection of appropriate development software is at the discretion of the centre.

Choice of development software
The choice of development software used to deliver the Unit is entirely at the discretion of the centre. The table below contains a non-restrictive list of possible examples of software development environments which might be suitable.

Development Software	
Scratch	Graphical-based development environment
TrackMania	Game design
MonkeyJam	Animation development

Notes on assessment of Outcome 2
Evidence for Outcome 2 can be generated throughout the Unit as an integral part of classroom activities. Teachers and lecturers will select the appropriate evidence to indicate that the learner can:

- identify the purpose of two basic constructs
- identify two editing features of the development software

The evidence need not be written, but could be presented orally or in digital form, eg by producing a presentation or a website.

Where learners' responses have been in oral form centres should are expected to keep either a recording of a learner's performance as evidence and/or an observation checklist.

All evidence should be gathered in supervised conditions.

Combining assessment within Units

It may be possible to develop learning/assessment activities which provide evidence that learners have achieved the standards for more than one Outcome within the Unit, thereby reducing the assessment burden on learners. Combining assessment of Outcomes (or parts of Outcomes) in this way is perfectly acceptable, but needs to be carefully managed to ensure that all Assessment Standards and Outcomes for the Unit are covered.

For example, it is possible to combine the assessment of both Outcomes in this Unit by:

- setting a series of practical tasks which necessitate the incorporation of basic constructs and editing features
- checking that the learner can identify and explain the purpose of those basic constructs which they have just used in the successful completion of their practical tasks

The process of checking can take the form of:

- a discussion with the learner which incorporates series of relevant questions and elicits appropriate oral responses

or:

- a series questions requiring written responses; these could, but not necessarily, be produced using word processing, presentation or other suitable applications

Gathering and storing assessment evidence

Assessment evidence may be produced in a variety of formats including presentations, web pages, digital photographs, digital video, podcasts and blogs, and these can be stored by the learner (or teacher) within a proprietary e-portfolio, or simply by storing them in a secure folder.

Developing Skills for Learning, Skills for Life and Skills for Work

Learners are expected to develop broad generic skills as an integral part of their learning experience. The *Unit Specification* lists the skills for learning, skills for life and skills for work that learners should develop through this Course. These are based on SQA's *Skills Framework: Skills for Learning, Skills for Life and Skills for Work* and must be built into the Unit where there are appropriate opportunities. The level of these skills will be appropriate to the level of the Unit.

The table below highlights opportunities to develop these skills during this Unit.

2 Numeracy	
2.3 Information handling	Information handling skills could be developed through setting problem-solving contexts in which learners are required to use and manage a sequence of operations to create a working digital solution.

4 Employability, enterprise and citizenship	
4.2 Information and communication technology (ICT)	Throughout the Unit learners will be continually interacting with the technology around them and will be given abundant opportunities to extend their ICT skills.

5 Thinking skills	
5.3 Applying	Learners will have opportunities to apply their software-based knowledge and skills and then identify and rectify simple errors in their digital solutions.

Equality and inclusion

The requirement to develop practical skills involving the use of equipment and tools may present challenges for learners with physical or visual impairment. In such cases, reasonable adjustments may be appropriate, including (for example) the use of adapted equipment or alternative assistive technologies. This is for both candidates and centres to consider.

It is recognised that centres have their own duties under equality and other legislation and policy initiatives. The guidance given in these Unit Support Notes is designed to sit alongside these duties but is specific to the delivery and assessment of the Unit.

Alternative approaches to Unit assessment to take account of the specific needs of learners can be used. However, the centre must be satisfied that the integrity of the assessment is maintained and that the alternative approach to assessment will, in fact, generate the necessary evidence of achievement.

Appendix 1: Reference documents

The following reference documents will provide useful information and background.

- Assessment Arrangements (for disabled candidates and/or those with additional support needs) — various publications on SQA's website: http://www.sqa.org.uk/sqa/14976.html
- *Building the Curriculum 4: Skills for learning, skills for life and skills for work*
- *Building the Curriculum 5: A framework for assessment*
- Course Specifications
- Design Principles for National Courses
- *Guide to Assessment* (June 2008)
- Overview of Qualification Reports
- *Overview of Qualification Reports*
- *Principles and practice papers for curriculum areas*
- *Research Report 4 — Less is More: Good Practice in Reducing Assessment Time*
- *Coursework Authenticity — a Guide for Teachers and Lecturers*
- *SCQF Handbook: User Guide (published 2009)* and SCQF level descriptors (to be reviewed during 2011 to 2012): www.sqa.org.uk/sqa/4595.html
- *SQA Skills Framework: Skills for Learning, Skills for Life and Skills for Work*
- *Skills for Learning, Skills for Life and Skills for Work: Using the Curriculum Tool*
- SQA Guidelines on e-assessment for Schools
- SQA Guidelines on Online Assessment for Further Education
- SQA e-assessment web page: www.sqa.org.uk/sqa/5606.html

Administrative information

Published: May 2016 (version 2.1)

History of changes to Unit Support Notes

Version	Description of change	Authorised by	Date
2.0	Changes made throughout the document to reflect the revisions to all Assessment Standards and the removal of Assessment Standards 1.4 and 1.5.	Qualifications Manager	June 2015
2.1	Clarification that animation should be within development software, not an application. Assessment Standards and notes on the delivery of Outcome 2 amended to reflect previous changes to the Unit Specification:	Qualifications Manager	May 2016

Unit Support Notes

Unit Support Notes — Information Solutions (National 3)

Please refer to the note of changes at the end of this document for details of changes from previous version (where applicable).

Introduction

These support notes are not mandatory. They provide advice and guidance on approaches to delivering and assessing the *Information Solutions* (National 3) Unit. They are intended for teachers and lecturers who are delivering this Unit. They should be read in conjunction with:

- the Unit Specification
- the Course Specification
- the Course Support Notes
- appropriate assessment support materials

General guidance on the Unit

Aims

The general aim of this Unit, as stated in the *Unit Specification,* is to for learners to develop basic knowledge, understanding and practical problem-solving skills in a range of applications. Learners will develop their practical skills by using appropriate application development tools to create, share and locate information. Learners will also show they have an understanding of some of the key features of a range of applications.

This Unit will give learners the opportunity to develop their thinking skills and skills in numeracy, employability, enterprise and citizenship.

The Unit can be delivered:

- as a stand-alone Unit
- as a component of the National 3 Computing Science Course

Progression into this Unit

Entry to this Unit is at the discretion of the centre. However learners would normally be expected to have attained some useful skills and knowledge from prior learning within their broad general education or by the following or equivalent qualifications and/or experience:

- National 2 Information and Communication Technology Course or relevant component Units

In terms of prior learning and experience, relevant experiences and outcomes may also provide an appropriate basis for doing this Unit.

Skills, knowledge and understanding covered in this Unit

Information about skills, knowledge and understanding is given in the National 3 Computing Science *Course Support Notes*.

If this Unit is being delivered on a free-standing basis, teachers and lecturers are free to select the skills, knowledge, understanding and contexts which are most appropriate for delivery in their centres.

Progression from this Unit

On successful completion of this Unit, the following Units and Courses provide appropriate progression pathways for learners:

- Information Systems Design and Development (National 4) Unit
- National 4 Computing Science Course
- National Certificate Group Awards in a range of Computing and IT disciplines
- National Progression Awards in Digital Media
- Skills for Work Courses in Creative Digital Media

Approaches to learning, teaching and assessment

The Unit is designed to provide flexibility and choice for both the learner and the teacher.

Learning and teaching activities should be designed to stimulate learners' interest, and to develop skills and knowledge to the standard required by the Outcomes and to the level defined by the associated assessment standards.

Tasks and activities throughout the Unit should be linked to relevant contexts.

The Unit and Course Specifications define the skills and knowledge required, but leave complete freedom to the teacher and learner to select interesting contexts in which to develop these. This provides scope for personalisation and choice, as relevant and motivating contexts can be used.

Examples of possible contexts for study could include the development of simple information systems to store and display data on subjects of genuine interest to the learner. This could include their hobbies, pastimes, leisure pursuits or academic interests. For example: a database of their music collection, a website with information on their favourite sport and sport stars or a blog on their involvement in a musical or dance group.

Individual, paired or group problem-solving tasks could be related to such contexts. For example a group could be tasked to collaborate in the production of a web-based information system on a national event of significant importance.

The National 3 Computing Science Course Support Notes provide further broad guidance on approaches to learning and teaching which may apply to both component Units of the Course, and should be read before delivering this Unit.

Sequence of delivery of Outcomes

The sequence of delivery of the Outcomes and the distribution of time between the Outcomes is a matter for professional judgement and is entirely at the discretion of the centre. Possible approaches are suggested, but other possibilities exist.

Delivering Outcome 1 and Outcome 2 simultaneously

One approach would be to combine the development of knowledge and understanding of the key features of applications at the same time as learners progress through the practical tasks involved in developing simple information solutions.

A useful approach would be to progressively introduce and demonstrate the relevant objects and operations as learners advanced through a series of practical tasks. For example, if using a database the teacher could demonstrate the creation of a file, records and fields before setting simple exercises to reinforce the learning, then checking the learner's understanding by observation and oral questioning.

The process could then be repeated with another cluster of operations such as: add records, browse records.

Delivering Outcome 1 and Outcome 2 sequentially
It is possible to develop the learner's practical skills in developing simple information solutions and meet the requirements of Outcome 1 before moving to formally identifying some of the key features of application software in Outcome 2. Some learners may benefit from the experience of completing practical tasks before moving to the more theoretical task of listing and explaining the purpose of features of an application.

Delivering Outcome 2 before Outcome 1
It is also possible to consider the key features of applications and meet the requirements of Outcome 2 before actually carrying out the practical task of developing simple information solutions in Outcome 1.

A useful approach in this instance would be to introduce the key features, objects and menus of a chosen software package and check that learners had grasped their purpose before setting practical exercises. For example, if using a blog to produce an information solution then an introductory demonstration of the key features such set up blog, templates, theme, password protection and writing a post would be would be appropriate. The teacher then would be tasked with assessing the learner's ability to list the appropriate objects and operations and explain their purpose.

Guidance on multi-level teaching
This Unit is not in direct hierarchy with any other Units at National 4 or National 2 level. However, it may be used as a fall-back option for learners in a National 4 Computing Science Course, who do not achieve the requirements for that Course.

If this Unit is being delivered in a multi- level class then it is important for the teacher to:

- have a clear set of teaching materials developed for each of the levels being delivered
- employ flexible grouping strategies appropriately to enable support to be delivered to groups and individuals where needed
- deploy formative assessment strategies consistently to ensure progress of all learners
- to carefully record the progress of the learners in each group

Useful resources
Although not a definitive list, the following resources may support the delivery of the Information Solutions (National 3) Unit.

Online resources
Online resources (websites, microsites, wikis, newsfeeds, databases, etc) can provide a valuable source of easily accessible and up-to-date information on a wide range of application development tools and topics.

Some suggested general online resources:

- Technology Student
- Teaching Education Scotland
- Education Scotland
- STEM Central on the Education Scotland website
- Khan Academy

Some suggested specific online resources:

- Filemaker Tutorials — Filemaker website
  Search for specific documents, videos and demonstrations in the Product and or Support sections of this website
- Serif WebPlus tutorials — Serif website
  Search for specific documents, videos and demonstrations in the Product Help section of this website. The Serif WebPlus search tool tutorial can also be found on the YouTube website
- Microsoft Frontpage tutorial can be found on the YouTube website
- Wiki tutorials can be found on the following websites:
  - commoncraft
  - wikispacetutorials
  - educationalsoftware
- Blog tutorials can be found on YouTube, WordPress and Blogger websites
- CS Unplugged
  A collection of free learning activities that introduce concepts such as binary numbers, algorithms and data compression through games and puzzles

Approaches to delivering and assessing each Outcome
The learner must demonstrate attainment of **all** of the Outcomes and their associated assessment standards. Assessment must be valid, reliable and fit for purpose.

SQA does not specify the methods of assessment to be used; teachers should determine the most appropriate method for their learners. In many cases, evidence (which may be oral or observational) will be gathered during normal classroom activities, rather than through formal assessment instruments.

Centres are expected to maintain a detailed record of evidence, including oral or observational evidence. Evidence in written or presentation format should be retained by the centre.

All evidence should be gathered under supervised conditions.

In order to ensure that the learner's work is their own, the following strategies are recommended:

- personal interviews with learners where teachers can ask additional questions about the completed work
- asking learners to do an oral presentation on their work
- ensuring learners are clear about acknowledging sources
- using observation checklists

Preparing learners for their assessment activities
In order to ensure that learners are prepared in advance for their assessment activities it is good practice for teachers to make learners aware of the assessment standards required and to provide a range of feedback designed to improve learners knowledge and skills as they progress through the Unit.

It is accepted as good practice that the evidence to meet the Assessment Standards for Outcome 1 and Outcome 2 be generated throughout the Course as an integral part of classroom activities.

Outcome 1

The learner will:

1 Develop simple information solutions using appropriate applications by:

1.1 Creating a structure to store information
1.2 Populating the structure with information
1.3 Identifying and rectifying simple errors
1.4 Maintaining information by keeping it accurate

Notes on delivery of Outcome 1: creating a structure
Learners are required to create a structure for each solution they produce. This will vary according to the application being used. If a database is used then the learner will create a file then set up structure consisting of appropriate fields and records. If a web authoring package or wiki is used then the structure will be based on a home page and a number of linked web pages. If a blog is used then the structure will centre around the posts, categories and links created.

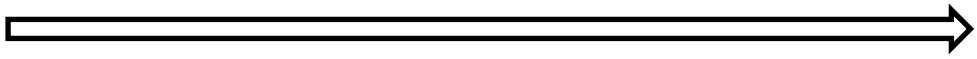
Whichever application is chosen, it is accepted good practice that learners plan their solution before beginning to implement it. The planning document, *which is not mandatory and not required for assessment*, could take a variety of forms.

Some examples are:

- a simple written description of the solution and the steps and objects involved in creating it
- a simple diagram or flow chart
- a mind map showing the steps and objects involved and how they are linked

The decision on which is the most suitable is at the discretion of the centre and may vary according to the software chosen to develop the solution. It even varies from learner to learner depending on their individual skills and abilities.

A progression of problem-solving exercises should be introduced gradually building the learners' skills and confidence. Table 1 below suggests, as a guideline, a progression of tasks.

Table 1		
Progression 		
Website		
select a template follow a wizard	select background colour insert text in home page	add pages insert text and graphics add hyperlinks for navigation set up search facility
Blog		
set up a blog select template select theme	write posts publish posts	set up categories link blog to website(s) use search facility
Database		
Create file set up fields add records	populate appropriate fields with text, numeric data and graphics browse records	search on one field sort on one field

Populating the structure
There should be opportunities for learners to use a wide range of data (text, photographs, graphics, audio/video files, etc) and from a number of sources (eg. cameras, video cameras, scanned images, online resources, microphones, mobile devices and other available and appropriate software and hardware). This also gives opportunities for learners to consider the suitability for purpose of different applications and to gain an understanding of associated implications such as internet security (acceptable use), and copyright law such as permission to use data and acknowledging sources.

Practical group work
It is possible to organise a practical group project. This does offer its own challenges and the teacher should ensure that:

- each member of a group is involved in the design of the solution and that each group member gets involved in sharing their ideas and opinions before drawing up the group's design for the digital solution
- the work is divided up equally among group members. This may involve assigning each member a distinct role or task
- each individual member's contribution is assessed

For example, learners could be asked to work as a group to design a wiki. Each member could then be tasked with creating their own page or pages, containing relevant information and graphics, within the wiki structure. A wiki is an excellent vehicle for such a group project since it is essentially a collaborative development application.

Notes on assessment of Outcome 1
Evidence of the Assessment Standards for Outcome 1 may be derived from a variety of applications such as databases, web page creation software, blogs, wikis, or online documents, with only one product from one application being submitted for assessment.

It is expected that, for each digital solution, the evidence collated consists of:

- a digital copy of the solution
- an observation checklist completed by the teacher detailing the adding, deleting and editing of information

It is important to note that the solution retained as evidence should consist of a representative sample of the objects and operations available in the application being used.

Storing solutions as evidence
Learners should store their digital solutions in a suitable folder or portfolio from which assessment evidence can be selected.

Outcome 2

The learner will:

2 Identify some of the key features of applications by:

2.1 Listing basic objects and/or operations

Notes on delivery of Outcome 2
It is envisaged that learners will investigate and use a minimum of one information solution development applications and should be able to identify some of their key features. The range of applications is not defined, allowing personalisation and choice and the selection of appropriate software is at the discretion of the centre.

The objects and operations which learners should list, and whose purpose they should state, to in order to meet this Outcome will vary according to the applications chosen by the centre.

Objects and operations
The objects and operations which learners should be introduced to in order to meet this Outcome will vary according to the applications chosen by the centre. The objects and relevant operations introduced at this level should be simple and fundamental.

For the purposes of non-mandatory guidance a set of exemplar objects and operations for several types of applications is set out below in Table 2 (current at time of publication, April 2012).

Table 2	
Objects	**Operations**
Database	
file	create
record	add records
field: numeric, text, graphic	create
	browse records
	search/query/on one field
	sort on one field
Website	
wizard	follow wizard's steps
template	select suitable template
home page	hyperlink page
page	hyperlink pages
background	select background colour
graphic file	add graphic
sound file	add sound file
search tool/component	add search tool/component
Wiki	
page	add page
background	select background colour
text	insert text
graphic	insert graphic
hyperlink	link pages
search facility	
Blog	
blog	set up blog
theme/template	select theme/template
post	write a post/publish post
search facility	search blog
category	set up a category
hyperlink	hyperlink blog to website

It is envisaged that, as they progress through the Unit, learners will develop a number of different information solutions incorporating a progressive series of problem-solving challenges.

Integrating Outcome 2 with the delivery of Outcome 1
A useful approach to would be to combine the delivery of both Outcomes. The teacher could:

- progressively introduce key objects and operations by demonstration and explanation, then
- reinforce the learners knowledge and skills by introducing related practical tasks

For further guidance see the section on **Sequence of delivery of Outcomes** above.

Choice of applications
The choice of applications used to deliver the Unit is entirely at the discretion of the centre. The table below contains a non-restrictive list of possible examples of application development software which centres may find useful.

Development software	
Database	Filemaker Pro, Open Office Base, Microsoft Access
Website authoring	Serif WebPLus, Microsoft Frontpage
Wiki	Wikispaces
Blog	Wordpess

Notes on assessment of Outcome 2
Evidence for Outcome 2 can be generated throughout the Unit as an integral part of classroom activities. Teachers and lecturers will select the appropriate evidence to indicate that the learner can:

- accurately identify key features by listing basic objects and operations

The evidence need not be written, but could be presented orally or in digital form, eg by producing a presentation or a website.

Where learners' responses have been in oral form centres should are expected to keep either a recording of a learner's performance as evidence and/or an observation checklist.

All evidence should be gathered in supervised conditions.

Combining assessment within Units

It may be possible to develop learning/assessment activities which provide evidence that learners have achieved the standards for more than one Outcome within the Unit, thereby reducing the assessment burden on learners. Combining assessment of Outcomes (or parts of Outcomes) in this way is perfectly acceptable, but needs to be carefully managed to ensure that all Assessment Standards and Outcomes for the Unit are covered.

For example, it is possible to combine the assessment of both Outcomes in this Unit by:

- setting a series of practical tasks which necessitate the incorporation of basic objects and operations
- checking that the learner can identify those objects and operations which they have just used in the successful completion of their practical tasks

The process of checking can take the form of:

- a discussion with the learner which incorporates series of relevant questions and elicits appropriate oral responses

or:

- a series questions requiring written responses. These could, but not necessarily, be produced using word processing, presentation or other suitable applications

Gathering and storing assessment evidence

Assessment evidence may be produced in a variety of formats including presentations, web pages, digital photographs, digital video, podcasts and blogs, and these can be stored by the learner (or teacher) within a proprietary e-portfolio, or simply by storing them in a secure folder.

Developing skills for learning, skills for life and skills for work

Learners are expected to develop broad generic skills as an integral part of their learning experience. The *Unit Specification* lists the skills for learning, skills for life and skills for work that learners should develop through this Course. These are based on SQA's *Skills Framework: Skills for Learning, Skills for Life and Skills for Work* and must be built into the Unit where there are appropriate opportunities. The level of these skills will be appropriate to the level of the Unit.

The table below highlights opportunities to develop these skills during this Unit.

2	**Numeracy**
2.3 Information handling	Information handling skills could be developed by setting problem-solving contexts in which learners are required to input data into a table or graphical format within a programs, share it with others and keep it updated.

4	**Employability, enterprise and citizenship**
4.2 Information and communication technology (ICT)	Throughout the Unit learners will be continuously interactive with the technology around them and will be given abundant opportunities to extend their ICT skills.

5	**Thinking skills**
5.3 Applying	Learners will be given opportunities to apply their application development-based knowledge and skills and then identify and rectify errors in their solutions.

Equality and inclusion

The requirement to develop practical skills involving the use of equipment and tools may present challenges for learners with physical or visual impairment. In such cases, reasonable adjustments may be appropriate, including (for example) the use of adapted equipment or alternative assistive technologies. This is for both candidates and centres to consider.

It is recognised that centres have their own duties under equality and other legislation and policy initiatives. The guidance given in these Unit Support Notes is designed to sit alongside these duties but is specific to the delivery and assessment of the Unit.

Alternative approaches to Unit assessment to take account of the specific needs of learners can be used. However, the centre must be satisfied that the integrity of the assessment is maintained and that the alternative approach to assessment will, in fact, generate the necessary evidence of achievement.

Appendix 1: Reference documents

The following reference documents will provide useful information and background.

- Assessment Arrangements (for disabled candidates and/or those with additional support needs) — various publications on SQA's website: http://www.sqa.org.uk/sqa/14976.html
- *Building the Curriculum 4: Skills for learning, skills for life and skills for work*
- *Building the Curriculum 5: A framework for assessment*
- Course Specifications
- Design Principles for National Courses
- *Guide to Assessment* (June 2008)
- Overview of Qualification Reports
- *Overview of Qualification Reports*
- *Principles and practice papers for curriculum areas*
- *Research Report 4 — Less is More: Good Practice in Reducing Assessment Time*
- *Coursework Authenticity — a Guide for Teachers and Lecturers*
- *SCQF Handbook: User Guide (published 2009)* and SCQF level descriptors (to be reviewed during 2011 to 2012): www.sqa.org.uk/sqa/4595.html
- *SQA Skills Framework: Skills for Learning, Skills for Life and Skills for Work*
- *Skills for Learning, Skills for Life and Skills for Work: Using the Curriculum Tool*
- SQA Guidelines on e-assessment for Schools
- SQA Guidelines on Online Assessment for Further Education
- SQA e-assessment web page: www.sqa.org.uk/sqa/5606.html

Administrative information

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History of changes to Unit Support Notes

Version	Description of change	Authorised by	Date
2.0	Changes made throughout the document to reflect the revision of Assessment Standards 1.3 and 1.4 in Outcome 1 and the removal of Assessment Standards 1.5, 1.6 in Outcome 1 and 2.2 in Outcome 2.	Qualifications Manager	June 2015
2.1	Assessment Standards and notes on the delivery of Outcome 1 amended to reflect previous changes to the Unit Specification:	Qualifications Manager	May 2016