Higher National Unit specification

General information

Unit title: Programming a Game for a Mobile Device (SCQF level 8)

Unit code: HH3C 35

Superclass: CB

Publication date: November 2016

Source: Scottish Qualifications Authority

Version: 02

Unit purpose

The purpose of this unit is to provide learners with the opportunity to create computer games for mobile devices. Learners will develop problem-solving and programming skills through the creation of a computer game for a mobile device using an appropriate mobile development platform, which can be an Integrated Development Environment (IDE) and Application Programming Interface (API) or dedicated game development environment.

Learners will identify a suitable mobile development platform and design a game using this platform. They will then produce a game for a mobile device with their development platform, including mobile interactions such as touch, swipe, or the use of a sensor such as GPS.

This unit is suitable for learners who already have some programming experience and have a good grasp of programming fundamentals.

Outcomes

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

1 Select a mobile development platform.
2 Design a game for a mobile device.
3 Create a mobile game for the selected platform.

Credit points and level

1 Higher National Unit credit at SCQF level 8: (8 SCQF credit points at SCQF level 8)

Higher National unit specification: General information (cont)

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Recommended entry to the Unit

Entry is at discretion of the centre but it is recommended that learners already have a background that includes a significant amount of programming. It is also recommended that learners should have achieved the Core Skill of *Problem Solving* at SCQF level 5 before undertaking this unit. Learners should be familiar with fundamental programming concepts at SCQF level 7, which can be demonstrated by one or more of the following HN units:

F8HC 34 *Structured Programming for Games*
H173 34 *Software Development: Introduction*
H17X 34 *Software Development: Programming Foundations*

It would also benefit non HN Games Development learners to have completed some games development unit at SCQF level 5 or 6 so they have an awareness of the games development process.

Core Skills

Achievement of this Unit gives automatic certification of the following:

Complete Core Skill Problem Solving at SCQF level 6

Core Skill component None

Opportunities to develop aspects of Core Skills are highlighted in the Support Notes for this Unit specification.

Context for delivery

If this Unit is delivered as part of a Group Award, it is recommended that it should be taught and assessed within the subject area of the Group Award to which it contributes.

Equality and inclusion

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

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

Higher National Unit specification: Statement of standards

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

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

Outcome 1

Select a mobile development platform.

Knowledge and/or Skills

- Development platforms for producing mobile games
- Programming languages for mobile development
- Current trends in mobile game development
- Integrated Development Environments and game development environments
- Evaluation of advantages and disadvantages of development platforms

Outcome 2

Design a game for a mobile device.

Knowledge and/or Skills

- Game Design documentation
- Media assets
- Plan for mobile specific interactions
- Plan for user interaction with the game

Outcome 3

Create a mobile game for the selected platform.

Knowledge and/or Skills

- Development environment/API to develop a game
- Programming language structures and data types
- Mobile specific interactions
- Software and user testing
- Future recommendations

Higher National Unit specification: Statement of standards (cont)

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Evidence Requirements

Candidates will need to provide evidence to demonstrate their Knowledge and/or Skills across all Outcomes.

The evidence for this unit may be written or oral or a combination of these. Evidence may be captured, stored and presented in a range of media (including audio and video) and formats (analogue and digital). Particular consideration should be given to digital formats and the use of multimedia.

The Evidence Requirements for this Unit will take two forms:

1 Evidence of cognitive competence (knowledge and understanding) for Outcome 1.
2 Evidence of practical competence (practical abilities) for Outcomes 2 and 3.

Outcome 1 is knowledge based and requires that candidates demonstrate their cognitive competence. Candidates must demonstrate that they will be able to:

- identify current development platforms available for producing mobile games.
- examine current trends in mobile game development.
- evaluate the development tools available.
- justify the choice of the tools and APIs selected to develop the mobile game.
- appropriately use diagrams, charts and illustrations to highlight key features.

Outcome 2 is best assessed in conjunction with Outcome 3 by the production of a design portfolio to include:

- a game Design Document (GDD) for the mobile game.
- suitable visual techniques to aid design processes.
- creation of appropriate media assets.
- storyboards/flowchart(s) to illustrate player interaction and/or progression in the game.

Evidence produced must be sufficient to clearly show the intended design and user interaction with the game.

Outcome 3 is best assessed in conjunction with Outcome 2 by a practical assignment where candidates must:

- create a working mobile game following the design created in Outcome 2.
- use a range of programming language structures:
  - implement Mobile interactions
  - declare and initialise variables
  - correctly use arithmetic and/or logical operators
  - implement a range of control structures
  - create and manipulate at least one data structure (eg array)
  - structure program according to development environment, eg use of objects/procedures
  - use the platform API or object library

  - pass parameters between objects/methods/functions as appropriate for the platform
  - follow platform code standards (indentation and presentation of code)
  - code commented throughout
- carry out user and software testing.
- propose features for future development of the game.

Evidence for practical competence may be produced over an extended period of time under open-book conditions; but where it is generated without supervision some means of authentication, such as questioning, must be carried out.

The Guidelines on Approaches to Assessment (see the Support Notes section of this specification) provides specific examples of instruments of assessment.

Higher National Unit Support Notes

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Unit Support Notes are offered as guidance and are not mandatory.

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

Guidance on the content and context for this Unit

Mobile games have become an increasingly important part of the games industry, it has provided an opportunity for smaller game developers to establish themselves and larger developers often release mobile versions of their popular games.

The unit is part of the HN Computer Games Development and primarily intended for delivery within this context to learners who want to pursue careers in the games industry. However, it could be taken by learners on the second year of programmes like HND Computing: Software Development. It is not suitable as an introductory programming unit or for learners who have limited programming experience.

Games developed for this unit should require a significant amount of programming — projects should not be based entirely on using drag and drop tools (although this can be part of a larger project).

This unit should focus on the additional knowledge and skills required to create games for a mobile platform using an appropriate development environment and utilising specific mobile interactions. The term 'mobile development environment' is intended to be generic and refers to any software that can be used to create mobile games with a recognised programming language. Examples could be an IDE like Android Studio, or a dedicated game development environment such as Unity or Unreal (provided they are able to cater for mobile). Other suitable development environments can also be used.

As part of the preparation for development, learners should carry out research on the development platforms available, their advantages and disadvantages, so that they have an appreciation of mobile development as a whole, before commencing work using a particular development environment.

Learners do not need to follow a particular programming paradigm on this unit. The overall code structure should suit the development environment and the focus will be on helping learners to understand this structure and facilitating game development.

The final choice of development environment is at the discretion of centres and the resources available. There are a number of freely available environments that would be suitable. Where possible it is suggested that learners are allowed to choose their own development environment and investigate it using tutorials and online forums to explore the features.

Higher National Unit Support Notes (cont)

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The game can be created as a prototype or extended proof of concept. Another possible idea would be to produce a mobile version of a game already in development for another unit, or a game that has been previously developed for a non-mobile platform. The gameplay can be modified/updated to suit the mobile context. Learners can decide the type of game they wish to produce, although touch friendly games with relatively simple gameplay should be encouraged.

By the end of the unit, learners should have a good awareness of current mobile development and experience of developing a working game for a selected mobile platform.

Guidance on approaches to delivery of this Unit

This unit should be delivered in a practical way. Delivery should be structured so that the majority of unit time is spent learning how to use the mobile development environment and investigating how to plan and program a game for a mobile device that utilises some of the specific interactions.

It is recommended that delivery follows the order of learning Outcomes — allowing learners to carry out research into mobile game development, then producing a game design and selecting a development environment and finally producing and testing a working game prototype.

Outcome 1 allows learners to carry out research into the current state of development technology for mobile platforms, focusing on the toolkits and programming environments and libraries available for developing games. The difference should be noted between more general purpose programming IDEs, such as Android Studio and game development environments such as Unity, which provides tools to facilitate game development.

There is a lot of scope for the lecturer to deliver presentations and facilitate class discussions and individual research; there is also the opportunity to allow learners to work in groups, each taking a different platform and then coming together to create a presentation or report on their findings.

Although learners should examine and compare several development platforms for their report, they can be guided towards a suitable development environment and IDE based on the resources available at the centre.

Outcome 2 focuses on designing a mobile game. This stage should build on the existing design skills and knowledge learners are likely to have at this level. Use of simple visual techniques, such as flowcharts and storyboards, is encouraged to minimise learning time and allow learners to begin working on their design concepts and ideas. The documents produced to support this stage can be considered working documents. They don't necessarily need to be highly polished or refined, but should be a solid basis for moving on to development.

Higher National Unit Support Notes (cont)

Unit title: Programming a Game for a Mobile Device (SCQF level 8)

In **Outcome 3**, learners will create the game they have planned for Outcome 2 using the development environment they have selected. Learners should be reminded of software and user testing methodologies, however, the main emphasis of this learning Outcome should be programming and development. Good coding practice should be encouraged and learners are expected to provide comments throughout the code. Development platform standards should be adopted for naming conventions and indentation.

The development environment must include a significant amount of programming, anything that uses extensive drag and drop will not be sufficient. Games may be created in the standard toolkits for Android/iOS/Windows Mobile — using Java or Objective C/Swift respectively. It is also permissible to use tools such as Unity or Unreal provided that they are used in a way that allows mobile user interactions such as touch and swipe — keyboard and mouse interaction is not acceptable.

Learners should already have an understanding of program design, although the scope of a mobile project may be larger and more complicated than they have previously encountered. A program template or design can be provided to learners for them to adapt to the requirements of their game and teaching activities can focus on how the template can be used and adjusted to suit different types of games and integrate mobile interactions.

A problem based approach is suggested where learners are provided with small projects to develop parts of a game, allowing them to learn how to use the code library of the development platform. In addition, they should learn how to use mobile specific interactions within their game and possibly how to utilise some of the sensors that are now commonplace in mobile phones, such as gyroscopes or the GPS sensor.

At this level, learners should already have a good understanding of how to carry out software testing, although class or individual exercises can be provided as a reminder. User testing can be illustrated with examples of questionnaires and surveys that can be used to obtain feedback. The importance of user testing for the development of new features should be emphasised to learners and delivery of this part of the unit can take the form of group discussions and presentations as well as exercises and research tasks.

A suggested breakdown of delivery times is as follows:

- Outcome 1: 10 hours
- Outcome 2: 7 hours
- Outcome 3: 23 hours

Guidance on approaches to assessment of this Unit

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

It is suggested that the assessments on this unit are carried out in the order of the Outcomes. Outcomes 2 and 3 could be combined into a single assessment.

Higher National Unit Support Notes (cont)

Unit title: Programming a Game for a Mobile Device (SCQF level 8)

Outcome 1

It is recommended that Outcome 1 is assessed by a single comparative report to include:

- A discussion of various mobile development toolkits and APIs available
- A discussion of programming languages used in mobile development
- An examination of current trends in mobile development
- A comparison of Game Development Environments and IDEs
- Evaluation of advantages and disadvantages of mobile development platforms

The suggested size of this report should be around 1,500 words.

Outcome 2

This learning Outcome should be assessed with Outcome 3 as a holistic project. This is best assessed by a portfolio of work that can be produced under open-book conditions.

This Outcome requires the candidate to produce designs for a mobile game. Designs here do not need to be as extensive as for a stand-alone design unit and these can be taken as working documents used for reference as the project continues.

- A game Design Document (GDD) for the mobile game which includes:
  - a detailed description and illustration of the gameplay.
  - identified media required for the game
  - storyboards to show interaction
  - suitable visual design techniques
  - creation of appropriate media assets
- Flowchart(s) to illustrate game progression

Evidence generated for the GDD can encompass a range of possible activities such as: storyboards, mood boards, character illustrations, level designs. Other appropriate techniques can also be used.

The game should be clearly and accurately described and the illustrations should show clearly the intended theme, genre, gameplay and progression through the game.

Mobile interactions should be clearly described/illustrated showing how they are used in the game to influence or control either the gameplay or the sequence (eg using a swipe to move from start screen to level 1).

Any media assets should be identified; these can be created as part of the development phase in Outcome 3.

Higher National Unit Support Notes (cont)

Unit title: Programming a Game for a Mobile Device (SCQF level 8)

Outcome 3

This Outcome will be assessed with Outcome 2 as a holistic project. The structure of the program will suit the platform selected (this is often Object Oriented).

The final game should demonstrate the following:

1 Code:

- Working game that meets the designs for learning Outcome 2
- Mobile interactions implemented
- Declare and initialise variables
- Correctly use arithmetic and/or logical operators
- Implement a range of control structures
- Create and manipulate at least one data structure (eg array)
- Structure program according to development environment, eg use of objects
- Use the platform API or object library
- Pass parameters between objects/methods/functions as appropriate for the platform
- Follow platform code standards (indentation and presentation of code)
- Code commented throughout

Minor bugs are permissible as long as the game as a whole is playable.

The game should use at least two different mobile interactions such as touch/tap, swipe and pinch. At least one of these interactions should be incorporated into the gameplay. Other appropriate interactions could involve the use mobile sensors such as the accelerometer to detect shaking or movement gestures. Any other appropriate interaction is also acceptable.

2 Testing

- Short test plan/discussion of testing to take place
- Software testing
- User testing
- Recommendations for future development of the game

Software testing should consist of appropriate techniques such as black box. Other types of software testing such as unit testing are also appropriate. The scope of testing and documentation should be appropriate for the game produced.

User testing could be conducted in a number of appropriate ways including questionnaires and surveys, interviews and so on.

Candidates should make recommendations for future development of the game, based on the current version, the overall design and vision and feedback from users.

Higher National Unit Support Notes (cont)

Unit title: Programming a Game for a Mobile Device (SCQF level 8)

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

Opportunities for e-assessment

E-assessment may be appropriate for some assessments in this Unit. By e-assessment we mean assessment which is supported by Information and Communication Technology (ICT), such as e-testing or the use of e-portfolios or social software. Centres which wish to use e-assessment must ensure that the national standard is applied to all learner evidence and that conditions of assessment as specified in the Evidence Requirements are met, regardless of the mode of gathering evidence. The most up-to-date guidance on the use of e-assessment to support SQA's qualifications is available at **www.sqa.org.uk/e-assessment**.

Opportunities for developing Core and other essential skills

As a programming unit, this lends itself to developing *Problem Solving* skills. It is also possible to build in activities that will develop *Numeracy* and *Working with Others* Core Skills.

This Unit has the Core Skill of Problem Solving embedded in it, so when learners achieve this Unit their Core Skills profile will be updated to show that they have achieved Problem Solving at SCQF level 6.

History of changes to Unit

Version	Description of change	Date
02	Core Skill Problem Solving at SCQF level 6 embedded.	21/02/17

General information for learners

Unit title: Programming a Game for a Mobile Device (SCQF level 8)

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

This unit is designed to cover developing a game for a mobile device. It is a non-introductory unit and assumes prior knowledge of and proficiency in programming concepts and techniques. F8HC 34 *Structured Programming for Games* unit is the recommended pre-requisite, however other introductory programming units may also be suitable. This unit will further develop your programming and problem solving skills.

In this unit you will learn to:

- examine different mobile development platforms. The tools and IDEs available and their advantages and disadvantages.
- design a game for mobile, including mobile interactions such as touch screen or the use of a sensor.
- program a game using a game development environment or IDE. You will learn how to use your development toolkit and its associated code library to produce a mobile game, carrying out testing to make sure it works correctly and user testing to ensure that your game is fun to play. You will need to amend any serious errors in your code so that the user has an enjoyable experience.

There may be two assessments in this unit. You may be required to produce a report looking at the development platforms available for mobile. You will then design, create and test a computer game for mobile.

When you have completed the above, you will be able to:

- evaluate mobile development platforms and toolkits.
- design a game for mobile and select a mobile development toolkit.
- create a mobile game for the selected platform.

As a programming unit, this lends itself to developing *Problem Solving* skills. It is also possible to build in activities that will develop *Numeracy* and *Working with Others* Core Skills.

This Unit has the Core Skill of Problem Solving embedded in it, so when you achieve this Unit your Core Skills profile will be updated to show that you have achieved Problem Solving at SCQF level 6.