Unit 22: Developing Computer Games

Unit code: K/601/7324

QCF Level 3: BTEC National

Credit value: 10

Guided learning hours: 60

Aim and purpose

The aim of this unit is to ensure learners know about different types of computer game, understand the impact gaming has on society and are able to design, develop, test and document computer games.

Unit introduction

There are many different types of computer games available which vary greatly in their look and feel, style, genre and complexity. Computer games can be played in a variety of ways, for example over the internet, on mobile telephones, on personal computers and on any of a wide range of mobile or static gaming platforms/consoles that are commercially available. A computer game is essentially a highly interactive software application so, as with any complex piece of software, it requires suitable design, coding, testing and documentation.

This unit is intended to prepare learners for the exciting and creative journey of designing, developing and testing computer game solutions using suitable tools, environments and techniques. It is an ideal starting point for learners considering a game development career path.

The unit content is divided between designing game components, implementing these using an appropriate development environment, testing the game and producing suitable accompanying documentation for both the target audience and technical personnel. Although it is recognised that the implementation phase is often the most enjoyable for the developer, equal emphasis is purposely placed on design and testing to ensure that the game is as fault-free as possible and meets the needs of the original specification.

It is of equal importance that learners are aware of the social impact, positive and negative, that computer gaming has had on individuals and society as a whole. Learners will explore the issues surrounding gaming and consider some of the research that has been carried out in this area.

Learning outcomes

On completion of this unit a learner should:

1 Understand the impact of the gaming revolution on society

2 Know the different types of computer game

3 Be able to design and develop computer games

4 Be able to test and document computer games.

Unit content

1 Understand the impact of the gaming revolution on society

Games in society: concerns eg excess playing time, social isolation, cost, separation from reality, education; benefits eg hand-eye coordination, brain training, thinking and strategy skills, future impact, impact on 'mainstream' application development

Psychological factors: effects eg use of sound, high score listings, competitive games, peer pressure, fun, educational value, expectations, levelling

2 Know the different types of computer game

Types of game: genres eg action games, Role-Playing Games (RPGs), adventure games, Real Time Strategy (RTS), strategy games, puzzle, platform, simulations, sports games, stealth shooter games, combat games, First Person Shooters (FPS), educational games, massively multiplayer online (MMO); gaming platforms/environments eg personal computer, portable hand held console, stand-alone platform, mobile phone, internet, video, network; technology eg graphics, AI, audio, game play (what the player does), scripting

3 Be able to design and develop computer games

Design: tools eg storyboards, pseudo code, narratives, action lists, graphical tools

Program design: purpose; modularity; systematic approach; data dictionary eg data types/structures, methods/procedures, parameters passed, return values, scope, visibility (private, public, static, friend, etc); other eg objects, instantiation algorithm design

Develop: choice of language eg object oriented or procedural, development facilities, menus, editing techniques, saving files, building or compiling code, built-in help facilities; coding; good programming practice eg suitable comments, small unitary code blocks, invocation, consistent indentation, descriptive identifiers

Coding: good use of program structures; syntax rules for the language; assigning values; operators; input/output statements; selection methods eg calls to external procedures; iteration loops eg pre-conditioned, post-conditioned, fixed; correct exit criteria

Data representation: types eg integers, real numbers, Booleans, characters, strings; declaring eg assigning constants, variables

4 Be able to test and document computer games

Testing methods: test strategy eg black box, white box, interface; iterative approach eg testing at various stages; test plans; test cases; test logs; test evidence; test reports; retests done

Testing tools: programming environment facilities eg debug program code, test program code; trace facilities and inspection techniques for the examination of variables during program execution

User documentation: specified game applications; purpose of game; operation of game; FAQs

Technical documentation: data dictionary; algorithm designs including control methods (selection, iteration); user interface method design; other eg action charts, action tables, input-process-output tables, class and instance diagrams, data flow diagrams

Assessment and grading criteria

In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria for a pass grade describe the level of achievement required to pass this unit.

Assessment and grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	**To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:**	**To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:**
P1 explain the impact of computer games on society		**D1** examine the psychological effects of computer gaming on individuals and society [IE3]
P2 describe different types of computer game		
P3 produce a design for a computer game for a given specification [CT1]	**M1** determine appropriate data types for a computer game and show how they are declared	**D2** explain how the structure and design of a game can assist in maintenance and capacity for extension.
P4 develop a computer game for a given specification [CT3]	**M2** use appropriate selection and iteration methods for a computer game	
P5 follow a test strategy to test and debug a computer game	**M3** use a variety of testing tools	
P6 produce user documentation for a computer game	**M4** suggest improvements to a computer game following user feedback. [RL4]	
P7 produce technical documentation for a computer game.		

PLTS: This summary references where applicable, in the square brackets, the elements of the personal, learning and thinking skills applicable in the pass criteria. It identifies opportunities for learners to demonstrate effective application of the referenced elements of the skills.

Key	IE – independent enquirers	RL – reflective learners	SM – self-managers
	CT – creative thinkers	TW – team workers	EP – effective participators

Essential guidance for tutors

Delivery

This unit provides broad coverage of the development of computer games together with an overview of the industry in which they are sold. Learners should be able to differentiate the computer game development cycle from a normal application.

Tutors involved in delivery should have an understanding of the chosen programming platform as well as a good understanding of the computer games industry.

LO 2 is concerned with understanding the different types of computer games and it is here that the tutor's knowledge of the industry is most required. This is an excellent opportunity for learners to experience different types of platforms within the classroom. Any in-class game play should be structured and if resources are permitting then the different genres and platforms could be made available for experiential learning.

Whilst discussing the different development areas it is important that learners understand the scale of development of a modern computer game compared to a normal software application.

LO1 deals with the effects of games on society, which takes the focus off the industry and onto groups of people and individuals. Learners may have difficulty initially transferring their attention from one to the other and the tutor can aid their understanding with newspaper clippings or reports. Learners will need to discuss and understand how computer games are perceived by some and the affects that they can have both positive and negative. Discussions will be a key component to this part of the delivery as well as research. The tutor should be careful as some violent incidents have been attributed to computer games and classroom discussions could stray into uncomfortable territory.

It is likely that, for most learners, this will not be their first contact with formal programming; however it is important that learners develop good habits and use a disciplined, systematic and methodical approach to creating game components. This will be particularly valuable should they progress to further study or to employment in the gaming sector. Object-oriented languages are particularly suited to game development so this unit could follow delivery of *Unit 15: Object Oriented Programming.*

The game developed for this unit will probably be a simple 2D game that will contain some graphical elements and a certain degree of complexity in terms of the programming expertise required in order to develop the game.

Any appropriate language can be chosen as the basis of the practical aspects of this unit. A game should include well-organised code, appropriate modules, objects and data structures and suitable interfaces (screens, forms, printouts, etc). Learners could potentially continue with the programming language they have used in previous programming units as long as the language has graphical interface abilities. The programming language needs to be complex enough to provide all of the requirements of the assessment criteria. It is possible to use Game Maker for this unit as long as the learner writes some code and references variables within the code and not just using the graphical tabs that generate code.

It is recommended that learners begin to program early in the unit. To be most valuable, these programming activities should steadily increase in complexity and provide lots of opportunity for formative feedback.

As larger and more complex activities are introduced, they can be provided in a context that shows learners examples of how user needs and programme designs are considered and presented. These can set and define learner expectations in terms of organisational requirements. Developing reusable modules is to be encouraged.

Outline learning plan

The outline learning plan has been included in this unit as guidance and can be used in conjunction with the programme of suggested assignments.

The outline learning plan demonstrates one way in planning the delivery and assessment of this unit.

Topic and suggested assignments/activities and/assessment
Introduction to the unit
Understand the different types of computer game: • whole-class exercise – tutor sparks class discussion of computer games and their effect on society • whole-class exercise -– tutor presentation on the psychology of gaming.
Understand the different types of computer game: • directed research – learners use tutor-provided sources to research what the different genres of games are • whole-class exercise – tutor presentation on games development, followed by whole-group discussion of which areas are suited to a set of skills • directed research – use tutor-provided source materials to research different gaming platforms.
Assignment 1 – Understand the Games Industry
Understand the principles and concepts behind the design and implementation of computer games: • whole-class exercise – tutor presentation on different design tools, followed by practical work on creating a narrative for a computer game • individual exercise – examine and report back on a tutor-set group of programming tools • individual exercise – tutor sets exercise to create examples of different kinds of data representation • whole-class exercise – tutor gives presentation on good coding, followed by practical exercises • individual exercise – create examples of logical constructs from tutor-provided materials • whole-class exercise – tutor presentation on program design, followed by whole-class practical.
Assignment 2 – Designing a Game
Implement, test, debug and document a computer game: • individual exercise – creating the game • whole-class exercise – discussion of when to use testing tools • whole-class exercise – tutor-led discussion of how to document your work • individual exercise – write mock user documentation
Assignment 3 – Create and Test
Assignment 4 – Document

Assessment

The *Programme of suggested assignments* table has split the assessment into four assignments but this is only a suggestion and any appropriate combination of assignments may be used. The scenario here is a mobile phone games development house that has employed the learner and wants them to design and develop a computer game for a fictitious movie

Suggested Assignment 1 – Understanding the Games Industry

For P1, learners should explain the impact of computer games on society with reference to the unit content. Evidence could take the form of a written report, or a poster if learners are feeling more creative, or as suggested in the programme of suggested assignment, form part of a presentation.

For P2, learners should describe the different types of computer game. This references the first part of LO2, and learners should be able to describe clearly most of the genres mentioned in the unit content.

D1 is an extension of this work and requires learners to research and comment on the psychological effects of computer gaming on individuals and society. Learners should reference studies undertaken on this topic, of which there are many.

Suggested Assignment 2 – Designing a Game

For P3, learners must begin producing a design for a computer game. It is suggested that learners are guided to illustrate the structure of the game and its code using any suitable method. Diagrammatical and text-based methods may be used to provide evidence, for example storyboards, pseudo code, narratives, action charts and graphical tools such as flowcharts, structure diagrams, class diagrams, data flow diagrams input-process-output tables. As games are highly interactive, it is important that learners show evidence of the planning and design of the user interface at an early stage.

M1 requires learners to detail the data types to be used in a game showing how they are declared. This will be evidenced with P3.

For D2 to be awarded learners must give a detailed explanation of how the structure and design of a game can assist in maintenance and capacity for extension. Learners should demonstrate this with examples from their own designs.

Suggested Assignment 3 – Create and Test

For P4, learners must create a working game that includes user interaction, variable assignments and operations. While tutors can allow learners to use the work done on P3 as the basis of the game, it is also acceptable to provide a standard generic game design that gives learners an equal opportunity to finish the game creation task in a timely fashion. Evidence will include a print of the coding for the computer game with either an observation record or annotated screenshot(s) of the running game. An actual functioning version of the game itself would provide excellent evidence as long as access is available to source code and the appropriate documentation.

For P5, learners must execute a test plan for their computer game. Each test should include a log of the result and refer to screenshots as evidence of test execution.

M3 is an extension of P5 and learners should demonstrate they have used all the testing tools as outlined in the unit content.

Suggested Assignment 4 – Document

For P6 and P7, learners need to produce all the documentation required for a working game, ie a user guide and technical documentation The documentation needs to be clear and thorough, as would be required if learners were working in a real-life game design/development studio.

For M4, learners will have to have user tested the game and collected feedback in order to suggest improvements. Evidence should include the user feedback.

Programme of suggested assignments

The table below shows a programme of suggested assignments that cover the pass, merit and distinction criteria in the assessment and grading grid. This is for guidance and it is recommended that centres either write their own assignments or adapt any Pearson assignments to meet local needs and resources.

Criteria covered	Assignment title	Scenario	Assessment method
P1, P2, D1	Understanding the Games Industry	As an industry newcomer, give a presentation on the different genres of games and their effect on society and individuals.	Presentation
P3, M1, D2	Designing a Game	A mobile phone games development house wants you to design a computer game for a fictitious movie.	Short report and practical design documents
P4, P5, M2, M3	Create and Test	Create the game designed for the previous assignment and test it.	Coding Observation records Test plans and logs Witness statements
P6, P7, M4	Document	Produce user and technical documentation for the game.	User guide Technical documentation

Links to other BTEC units

This unit forms part of the BTEC in IT sector suite. This unit has particular links with the following unit titles in the IT suite:

Level 1	Level 2	Level 3
		Unit 35: Digital Graphics for Interactive Media
		Unit 36: Computer Game Platforms and Technologies

Essential resources

Learners should have access to an appropriate hardware and software development environment for practical programming tasks with online help and/or manuals, for example Dark Basic, C++, C#, Java, .NET.

Delivery of personal, learning and thinking skills

The table below identifies the opportunities for personal, learning and thinking skills (PLTS) that have been included within the pass assessment criteria of this unit.

Skill	When learners are …
Independent enquirers	examining the psychological effects of computer gaming on individuals and society
Creative thinkers	producing a design for a computer game developing a computer game for a given specification
Reflective learners	suggesting improvements to a computer game following user feedback.

Although PLTS are identified within this unit as an inherent part of the assessment criteria, there are further opportunities to develop a range of PLTS through various approaches to teaching and learning.

Functional Skills – Level 2

Skill	When learners are …
ICT – Using ICT	
Plan solutions to complex tasks by analysing the necessary stages	designing a computer game for a given specification
Select, interact with and use ICT systems safely and securely for a complex task in non-routine and unfamiliar contexts	developing a computer game for a given specification
ICT – Developing, presenting and communicating information	
Combine and present information in ways that are fit for purpose and audience	writing the user and technical documentation
English – Writing	
Write a range of texts, including extended written documents, communicating information, ideas and opinions, effectively and persuasively	writing the user guide for the computer game.