Unit 23: Computer Graphics

Unit code: H/601/5801

QCF Level 2: BTEC First

Credit value: 10

Guided learning hours: 60

Aim and purpose

The aim of this unit is to give learners a knowledge of the hardware and software used to generate and manipulate computer generated images. Learners will then acquire the skills to produce computer graphics and use them to enhance documents.

Unit introduction

Graphics are now an everyday part of computer use. With the reduction in price of devices such as digital cameras, colour printers and high-capacity storage drives, what was once the domain of specialist graphic designers is now open to everyone.

Computer graphics are used in a wide variety of ways, from pictures enhancing the look of a website or poster, to diagrams used to simplify and explain information. Not all computer images are created from scratch: digital photographs or paper images, can be imported and modified using specialist software and hardware. With the right software, a photo can be changed to make the sky look more blue, the focus can be sharpened or softened and it can even have someone removed from it completely.

In this unit, learners will gain knowledge of how to use a variety of different software applications to create and modify computer graphics. Successful learners will create both pictures and diagrams, using a range of tools and techniques and learn how to select, edit and export images into other documents.

Before creating an image, thought needs to be given to what the image is going to be used for, eg advertising, illustration, who is the target audience, what size should the image be and how will it be communicated. Such considerations will affect the final image and how it is created. In a commercial context, understanding the use and purpose of an image is as important as having the ability to exploit the software.

Learning outcomes

On completion of this unit a learner should:

1   Know the hardware and software required to work with computer graphics

2   Be able to create computer graphics to meet a user need

3   Be able to use computer graphics to enhance a document.

Unit content

1 Know the hardware and software required to work with computer graphics

Hardware: graphics specific eg graphics card, graphics tablet, digital camera, printer, monitor; general eg RAM, processor; file storage eg CD ROM, hard drive

Software: vector graphics software eg Corel Draw, Visio, Serif Draw Plus; dedicated raster graphics (bitmap) software eg Paintshop Pro, The GIMP, Paint; dedicated photo manipulation software eg Photoshop, Photoshop Elements, Serif Photo Plus; graphics facilities other packages; other tools eg image viewers, photo galleries

File handling: converting files; file sizes; file formats eg bmp, jpeg, gif; file management eg naming files, folder structures, moving files, deleting files; compression techniques

2 Be able to create computer graphics to meet a user need

User need: user requirements; constraints eg house style, colours, image size

Computer graphics: bitmaps; vector graphics; comparison eg type of image, file size, scaling

Tools and techniques: standard software tools eg freehand draw, rotate, flip, resize, crop; group/ungroup; layout grids; special effects eg sharpen, soften, posterise; templates eg for letterheads; other eg use of shape libraries, colour change, colour balance; colour depth eg 8-bit (256 colours), 16-bit (64,000 colours)

Reviewing: checking text eg proofreading; against objectives eg size of image, download speed, image resolution; suggestions for improvement

3 Be able to use graphics to enhance a document

Acquired images: specialist hardware eg scanning, digital camera, mobile phone; clip art library; editing eg cropping, rotating, resizing, colour correction; inserting into document; manipulating within document eg resizing, cropping, text wrapping, positioning; relevant laws and guidelines eg copyright issues; combining information

Objects: images eg jpeg, bitmap, clipart, vector; others eg text, shapes, drawings

Assessment and grading criteria

In order to pass this unit, the evidence that learners present 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 identify the hardware and software required to work with computer graphics	**M1** describe the features of different graphical hardware devices	
P2 state the functions of a defined graphics software package	**M2** describe the features of different graphics software packages	**D1** evaluate a graphics software package on its ability to create and edit computer graphics [IE4]
P3 describe the differences between raster (bitmap) and vector graphics		
P4 use specialist hardware to acquire images for a defined purpose [CT1]	**M3** use graphics software to edit an image for a given purpose. [CT1, CT6]	**D2** explain the impact that file format, compression techniques, image resolution and colour depth have on file size and image quality. [IE3, IE6]
P5 create an original graphic for a defined user need using graphics software [CT1, CT6]		
P6 use graphics to enhance a document incorporating acquired images and objects. [CT1, CT6]		

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 is a practical unit and the emphasis should be on the learners gaining the practical skills in a variety of graphics packages. Learners should experience a basic graphics package (such as Paint), a basic vector-based package (such as Visio), a photo manipulation package (such as Photoshop) and also be aware of the graphics facilities in packages such as Word or PowerPoint. Learners should be made aware that other more complex packages exist, but shouldn't need to tackle the complexities of full CAD packages such as AutoCAD or Pro Desktop.

Learners must have the opportunity both to create original images and to modify existing ones (these could be from clip art, digital photographs or scanned images). Learners need to be able to use suitable hardware, either a scanner or digital camera, to acquire an image for editing, rather than be provided with an image that has already been acquired.

As learners need to create and modify images for a user need, scenarios need to be provided to allow learners to meet the assessment criteria. A suitable scenario could include creating company advertising material, which could include the creation of a logo and a simplified map diagram, adding clipart and the importing of a suitably modified photograph.

Learners should work independently to create their images and documents. Assessment evidence should include a final version of their images and documents, but may be supported by witness statements as to the packages, tools and techniques used.

If possible, the user indicated in P5 could be external to the centre — it is possible that individually, learners might be able to find small companies or individuals who would be willing to define a need. The reality of working for a customer in this way would lend a perspective that would be harder to achieve with centre-devised scenarios.

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
Know about hardware and software associated with computer graphics:
• whole-class exercise – tutor presentation on imaging hardware, followed by individual exercise
• whole-class exercise – tutor presentation on image editing software, followed by individual exercise
• individual activity – learners investigate different types of image files and their properties.
Assignment 1 – Graphic Design for Dummies
How to create and modify images:
• whole-class exercise – tutor presentation on understanding user need
• individual exercise – learning image editing techniques
• pairs exercise – review each other's images and recommend improvements.
Assignment 2 – Making Images

Topic and suggested assignments/activities and assessment
Select and acquire images for use in other documents:
• whole group exercise – selecting images for documents
• individual exercise – learn how to manipulate images inside a document.
Assignment 3 – Picture Perfect

Assessment

Some of the evidence needed for this unit could be generated alongside that required for other units, particularly *Unit 29: Using ICT to Present Information*.

To achieve a pass grade, learners must achieve the six pass criteria listed in the assessment and grading criteria grid.

For P1, learners need to identify the hardware and software needed to create and edit computer graphics. The unit content describes details the different types of hardware and software learners are expected to be familiar with. Learners need to do more than just list the necessary hardware and software they need to demonstrate their understanding why the particular item of hardware or software is needed. Evidence may be in the form of a written document, a presentation, or an observation record of a question and answer session.

For P2, learners must state the functions of a defined graphics software package. This is likely to be the package that they will be working with most often. Learners need to do more than just list their functions. Statements need to be made that demonstrate understanding as to what the function does and how it might reasonably be used. Evidence may be provided in the form of written documentation or a presentation.

For P3, learners need to show an understanding of the main differences between vector and bitmap graphics and how they are used and need to illustrate their descriptions with suitable examples of both types of images. Again, evidence may be written documentation or a presentation.

For P4, learners must acquire an image using appropriate specialist hardware, such as a scanner or digital camera. The image needs to be for a defined purpose and tying this to the image editing in M3 would be useful. Evidence should contain a hard copy of the acquired image but should be supported by either written commentary or witness statements in relation to the hardware, packages, tools and techniques used.

For P5, learners need to create their own graphic from scratch, using appropriate dedicated software Images do not have to be complex, but should make correct use of the software tools and techniques as noted in the content. These criteria could be linked to P6, so that learners create an image that is suitable for use in a multi-page document. Evidence could be most easily generated through a written document with appropriate screengrabs, showing stages in the production of the image and describing the tools and techniques used.

For P6, learners must use graphics to enhance a document incorporating acquired images and objects. The document should be multi-page and could be based on one produced for P5, D1 or D2.

To achieve a merit grade, learners must achieve the six pass criteria and all three merit criteria listed in the assessment and grading criteria grid.

For M1, learners may use their experiences of acquiring images for P4 as a basis for their description. The obvious devices are a scanner and a digital camera but whatever is chosen, learners should have the opportunity to use the devices that are being described. Evidence is most easily generated through written work and may be presented as a table, but may also be through observation records based on formal discussions.

For M2, learners need to describe the features of different software packages used to create and edit computer graphics. The packages could include those used to create the images for P3 and P4, alongside a general package with graphics capabilities such as the drawing tools in MS Word. Features must be described, rather than just listed, and an effort should be made to look at comparable features over a range of software. Evidence may be in the form of a written document, presentation or observation records based on formal discussions.

For M3, learners must use graphics software to edit an image for a given purpose. This purpose could be a scenario given to learners or an external client, such as the production of advertising material or a presentation. The image could be one of those created and acquired for P3, P4 and P5, but could also be one downloaded from the internet, or from clip art, for example. The finished image must satisfy the stated purpose. A real client could provide significant positive feedback to learners as well as providing valuable evidence. Learners should be encouraged to see the evidence produced for M3 as a showcase of their developing skills.

To achieve a distinction grade, learners must achieve all of the pass and merit criteria and the two distinction criteria.

For D1, learners could evaluate the package used for P5 or M3. The evaluation must include comments on how well the package helps learners to meet the stated requirements, along with suggestions for improvement. Evidence could be generated most easily through a written document with appropriate screen grabs.

For D2, learners must examine different file formats, including all those listed in the unit content for LO1. They must explain the impact that those file formats, and the compression techniques, image resolution and colour depth associated with them, have on file size and image quality. Evidence could be presented as a written document, or presentation.

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 Edexcel assignments to meet local needs and resources.

Criteria covered	Assignment title	Scenario	Assessment method
P1, P2, P3, M1, M2, D1, D2	Graphic Design for Dummies	A local business is looking for a graphic designer. It has asked you for background guidance on graphic design.	Oral presentation Leaflet, report or poster
P4, P5,	Making Images	The business has now asked you to create a number of images for it.	Observation Screen grabs Leaflet or report
P6, M3	Picture Perfect	The business wants to use one of the images for a new purpose, and has asked you to make some changes for it. The image is to be placed, with others, into a publicity leaflet.	Observation Screen grabs Leaflet or report

Links to National Occupational Standards, other BTEC units, other BTEC qualifications and other relevant units and qualifications

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 30: Digital Graphics

Essential resources

Learners will need access to a range of relevant graphics software (Paint, Visio, Photoshop or similar), plus hardware capable of running them. Access to devices that are used by learners to acquire images is necessary, eg scanner, webcam, digital camera, mobile phone. The organisation of the resources must allow for all learners to actually use the devices.

All learners need ready access to a high quality black and white printer and occasional access to a colour printer as required.

Employer engagement and vocational contexts

The use of vocational context is essential in the delivery and assessment of this unit. Learners will require access to computer equipment to enable them to gain a practical awareness and enable them to apply their knowledge and understanding in a practical situation.

There is a range of organisations that may be able to help to centres engage and involve local employers in the delivery of this unit, for example:

● Learning and Skills Network – www.vocationallearning.org.uk

● Local, regional business links – www.businesslink.gov.uk

● National Education and Business Partnership Network – www.nebpn.org

● Network for Science, Technology, Engineering and Maths Network Ambassadors Scheme – www.stemnet.org.uk

● Work-based learning guidance – www.aimhighersw.ac.uk/wbl.htm

● Work Experience/Workplace learning frameworks – Centre for Education and Industry (CEI University of Warwick) – www.warwick.ac.uk/wie/cei.

Indicative reading for learners

Textbooks

Sanchez J – *The PC Graphics Handbook: A Reference Manual on PC Graphics Hardware and Software* (CRC Press; 2003) ISBN-10: 0849316782

Walsh Macario J – *Graphic Design Essentials: Skills, Software and Creative Solutions* (Laurence King, 2009) ISBN 1856695999

Website

http://graphicdesign.about.com/

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 …
Creative thinkers	generating ideas and exploring possibilities when using specialist hardware to acquire images for a defined purpose, as well as creating an original graphic for a defined need using graphics software
	adapting ideas as circumstances change.

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.

Skill	When learners are …
Independent enquirers	analysing and evaluating a vector image and a bitmap image produced against given requirements, judging its relevance and value to suggest ways they could be improved
	analysing and evaluating a given system specification on its ability to create and edit computer graphics and recommend potential improvements and consequent benefits
	exploring issues, events or problems associated with file format, compression techniques, image resolution and colour depth on file size and image quality
	supporting conclusions when explaining the impact that file format, compression techniques, image resolution and colour depth have on file size and image quality.
Creative thinkers	generating ideas and exploring possibilities when using graphics software to edit an image for a given purpose, and adapting ideas as circumstances change.

● Functional Skills – Level 2

Skill	When learners are …
ICT – Using ICT	
Select, interact with and use ICT systems safely and securely for a complex task in non-routine and unfamiliar contexts	describing the hardware and software is needed to work with computer graphics
Select information from a variety of sources to meet requirements of a complex task	producing and using graphics to enhance a document incorporating acquired images and objects
Combine and present information in ways that are fit for purpose and audience	producing and using graphics to enhance a document incorporating acquired images and objects.