Unit 16: Digital 2D and 3D Graphics

Delivery guidance

This optional unit presents learners with the opportunity to explore two-dimensional (2D) and three-dimensional (3D) digital graphics using industry standard tools and techniques.

Digital graphics are typically the key component in most types of modern media presentations, including websites, print and broadcast media and videogames.

The key to creating attractive, engaging and commercially valuable digital graphic relies on three core skills:

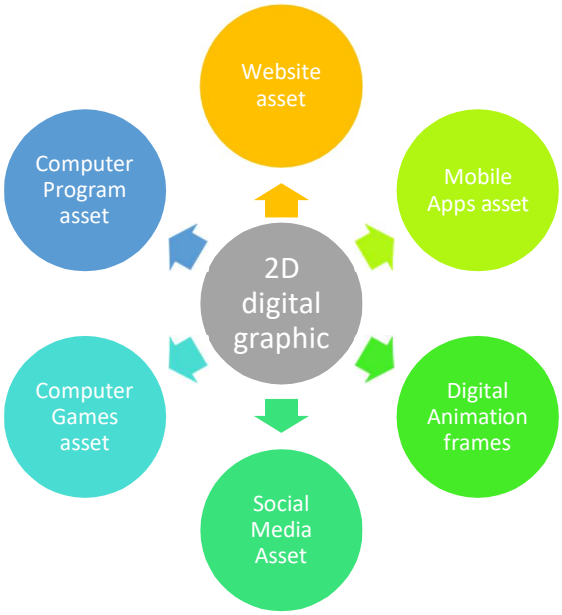
- understanding the purpose and characteristics of visual communications
- being able to interpret a client brief correctly to design a suitable digital graphic solution
- having the practical skills and appropriate workflow to develop designs into assets that are fit for the purpose.

This unit will give learners underpinning knowledge that helps them to investigate different forms of 2D and 3D digital graphics, their commercial applications and the techniques and skills required to generate them confidently and creatively.

Learners should develop their visual communication, research and design skills, in order to effectively convert project briefs into practical ideas. They should be able to present ideas and evaluate work and decisions with peers and clients.

If there are opportunities to involve local employers as clients, this will enhance the project and the learner experience.

There are also many opportunities for you to link and embed learning aims with other technical units, for example, a learner could use their 2D digital graphic as shown in this diagram:



It would be ideal if the class or course had a social media page, as this is a good way for learners to share some of their documented outcomes as recommended in this guide and in the scheme of work.

Approaching the unit

This unit lends itself to a three-fold approach to learning:

- research-based investigation into visual communication, media industry and relevant legal requirements
- free form and client brief-led exploration of design ideas in 2D and 3D
- practical skill-based development of 2D and 3D digital graphics using commercially relevant software and hardware.

Learners are likely to enjoy the problem solving of interpreting a client brief and extending their practical skill set into the realm of producing digital art. While learners may have some prior experience of creating 2D digital graphics, the progression into 3D digital graphics can be a challenge for some but often yields a greater sense of self- achievement.

Enhance each approach through the introduction of specifically selected case studies, engaging industrial visits, industry-led technical workshops, exhibitions and conferences, inspirational guest speakers and mentors (from local industry) and constructive peer review.

Many different software products exist to create 2D and 3D digital products. It is recommended that a variety of hardware (e.g. Apple and PC) and software (open source and proprietary) should be experienced where possible and that learners should explore the use of other digital capture devices, for example, camera, scanner, digital graphics tablet. You may even decide to include learners' mobile devices for a comparative effect.

Delivering the learning aims

Learning aim A

This aim investigates the purpose and characteristics of digital graphics that are an important part of visual communications.

As an underpinning learning aim containing the majority of the theoretical content for the unit, some can see this as challenging to engage learners. Encouraging the learners to understand the purpose of digital graphics is best achieved through the use of relevant case studies, such as digital graphics involved in multimedia campaigns which are current or have caught media attention recently (for good or bad). Naturally, discretion is advised when choosing subject matter to ensure that it should not offend – although this can prove to be useful to start moderated discussion.

Data collection exercises driven through market research activities can get the learners 'out and about', asking members of a community about digital graphics and their views on their use in various products. This can be very useful when investigating the information, message and meaning being communicated to a wider audience. Potentially this could even be achieved via social-media-based polling, if preferred.

Group-based projects can be a useful vehicle for encouraging learners to communicate ideas visually, particularly if they have time to critique their peers and self-evaluate. Some practitioners attempt to incorporate socially relevant themes as hidden learning when planning this type of activity.

Legal considerations are a highly important aspects within creative units such as this and should be given appropriate levels of attention.

The second sub-aim focuses on the technical vocabulary of 2D and 3D digital graphics, often offering thematic links with material that may be covered in other units within the specification (such as *Unit 1*). A blended, or at least 'signposted' approach can be helpful for learners.

In A3 learners are expected to explore different hardware and software used in the development of 2D and 3D graphics. The range of software can be quite daunting, and while some suggestions are given in the 'Resources' section of this guide the unit does not lend itself to specific software. Centres may use any software that allows learners to access the full breadth of the content.

Learning aim B

The second aim focuses on the design part of the digital graphics workflow and charts the processes and techniques that learners must consider when planning the production of digital graphics (2D or 3D) to suit the required specification.

Learners designs should be in response to a given client brief. Class-based practical activities can be organised which facilitate the free exchange of ideas during brainstorming. This is a good way to simulate target audience research, which will help improve the quality of the designs and the final product(s). Learners should aim to use a range of tools when presenting ideas including mood boards, storyboards and thumbnail sketches, as appropriate.

Learners need to understand the various options for processing digital graphics before they can practically apply them, or consider their use in a design, in response to a brief. As such, introducing learners to the practical skills involved with the various processing, editing and compression techniques during learning aim A and learning aim B can be very insightful and lead to higher quality learner outcomes. The impact that each could potentially have on the user's experience should also be outlined with particular reference to the quality, compatibility and usability. Each selected technique may also have particular hardware or software requirements that need to be recognised and accommodated, for example, improving the clarity and crispness of textured 3D objects (usually in video games) using anisotropic filtering is typically hardware reliant.

Throughout the design stage the learner should seek feedback form the client (and where possible test users) in order to refine the quality and appropriateness of the design. They should keep records. They should also understand the importance of documenting this process by keeping records of feedback received and changes made, to contribute to the final evaluation.

Learning aim C

The final learning aim focuses on the practical development of the previously made 2D and 3D designs into final products that meet a client brief.

Broadly speaking you can divide the content into three areas: an examination of the 2D and 3D tools with which learners should gain technical competence, the ability of the learner to review and evaluate their final products (with input gathered from others) to further the development of their professional skills, knowledge and behaviours.

Learners should be able to demonstrate the practical skills necessary to create and manipulate 2D images for a given purpose using the tools available in the selected application software.

Naturally, you should formatively assess these skills through in-class activities and/or self-directed tasks away from the classroom before summarily assessing. Short and sharp testing works well here and may be suitable as a session's lead activity.

You may use a similar approach for 3D graphic tools, although this type of software is notoriously more complex in terms of understanding the user interface and remembering the typically complex

mouse/key combinations required, so some mild caution is advised. In addition, abbreviations and acronyms can be somewhat obtuse, for example, NURBS (non- uniform rational basis spline) and initially confusing for learners with weaker mathematic skills. For these reasons, additional in-class support and guidance is often required, particularly when working with more complex models and meshes or where learners have conceptualisation issues.

The use of extra-curricular clubs for 3D modelling can be a useful option for reinforcement and encourage self-study.

Unless the offer is available in-house, you could also investigate whether a representative from an approved training provider delivering specific vendor-oriented study programmes could visit and give information about the courses and certification (particularly as some learners may opt to study such a qualification alongside or after completion of this course).

Learners should be able to effectively review both their own efforts and those of their peers, typically through verbal critique and written feedback. You should encourage learners to assess their digital products against the client's requirements (the original brief).

Evaluation and review benefits from repeated exposure; learners may be initially reluctant to give critical feedback in a constructive fashion. However, after routinely repeating the process at the end of a practical task it soon becomes an intrinsic, normal and rewarding part of the learning process. Some practitioners may feel inclined to incentivise, promoting 'Digital artist of the week' awards to recognise exceptional performance, for example.

High quality, accurate written and verbal communication skills are vital for progression into higher education and in employment. As such, learners should be confident in presenting thoughts and ideas to others and allowing learners to engage with a 'client' and test users is a great way to develop this skill. It is a good experience for learners if a real-life client can be found, but this can be simulated with the Tutor, or other responsible adult, acting as the client. Learners should also produce well-presented, accurate and appropriate documentation for all stages of a project. Learners must be able to effectively evaluate the success of a project and the factors that contributed to the final outcome, including their own skills, knowledge and behaviours.

Assessment model

Learning aim	Key content areas	Recommended assessment approach
A Investigate the purpose and characteristics of digital graphics that are an important part of visual communications	**A1** Purpose of and legal requirements for digital graphics **A2** Representation and applications of 2D and 3D digital graphics **A3** Hardware and software tools for digital graphics	A report or detailed presentation on the purpose and technical characteristics of, and legal considerations for, 2D and 3D digital graphics.
B Design 2D and 3D digital graphics products to meet a client brief	**B1** Planning digital graphics **B2** Design documentation for digital graphics **B3** Digital graphics processing and techniques **B4** Reviewing and refining designs	A design specification showing the planning and design of 2D and 3D digital graphics products that could be used in a larger media product. Digital graphics files that fulfil the design specifications, accompanied by supporting development documentation. An evaluation of the digital graphics against the client brief. A record of personal performance while completing the activity, such as whether work was submitted on time.
C Develop 2D and 3D digital graphics products to meet a client brief	**C1** Tools and techniques for developing digital graphics **C2** Reviewing the final 2D and 3D digital graphics products **C3** Professional behaviours	

Assessment guidance

The assessment for this internally assessed unit would benefit from being divided into two assignments as shown in the table.

This section gives only an overview of the assessment requirements. Centers should refer to the *Essential information for assessment decisions* and *Assessment criteria* sections of the specification for specific and detailed assessment requirements.

Assignment 1 (learning aim A)

A thoroughly researched report, possibly similar in style to a digital arts magazine-style article, or learner-led presentation focusing on the hardware and software tools used for the creation of 2D and 3D digital graphics, their applications and impact in the wider media industry and the legal requirements that must be observed.

Offering learners a choice of presentation medium for their evidence will often encourage individual thinking and allow them to embrace the various possibilities presented by the medium chosen, for example, integrating interactive 3D assets into their presentation or including specifically created 2D art in a magazine article.

Things to remember to offer the best opportunity for learner success:

- Learners must include coverage of the different types of digital graphic products (both 2D and 3D), using technical language accurately in their descriptions. Comparison of different 2D formats, that is raster versus vector-based is essential, demonstrating a firm understand on how this relates to file formats, scaling accuracy and resolution.
- Learners should evaluate the effectiveness, usability and accuracy of different digital graphics based on their purpose and how the use of digital graphics characteristics impact on their effectiveness and appropriateness.
- Learners should explore a range of examples of images of different types of 2D and 3D images(e.g. video game assets) and their purpose (entertain, inform etc.).
- Learners should explain the purpose and legal considerations when creating different types of digital graphic products.
- If the report format is selected, it would ideally follow a recognised format (either formal or informal) and should be presented as a professional business document, with consistent use of correct grammar and spelling and correct referencing of information sources.
- Access to appropriate hardware, software and tutorials is required in order for learners to create bespoke images or customise existing ones.
- Learners will need to access a range of both published and online sources to provide the academic content.

Assignment 2 (learning aims B and C)

Ideally, you could link this assignment with other units to form part of an integrative assignment. Examples could include creating graphics (sprites, backgrounds etc.) for an interactive game or artwork assets for use in a mobile app. If an integrated assignment is used, remember that in order to assess against a unit's assessment criteria the learner must ensure that the evidence given fully meets the requirements as outlined in the unit. For example, if combining this unit with the *Mobile apps* unit when 'reviewing designs' the evidence for this unit must specifically focus the review on the images, and the *Mobile Apps* unit would need to focus on the app.

Alternatively, the use of a 'live' industry brief from a sponsor or mentor can give fertile ground for creative efforts. Where possible it should include hidden learning, which can support progress in other units and afford some inter-curricula links.

The task/brief must involve the design and creation of 2D and 3D assets that should be fit for a given purpose.

Things to remember to offer the best opportunity for learner success:

- Learners should demonstrate evidence of research that is pertinent to the client brief, generating a range of potential designs for each digital product required. Learner notes that justify their decisions through a clear understanding of core 2D and 3D design principles, the intended audience and purpose should accompany each design.
- Once final designs have been selected these should be developed using appropriate hardware and software tools. Expect the learner to document each part of the creation process, providing detailed explanations of the tools and techniques used with a rationale.
- Completed digital images need to be evaluated by the learner against the client brief and should draw upon the technical standard of the final product, the range of techniques used and how closely they have resolved the client's requirements.

- You should also expect higher achieving learners to demonstrate their individual responsibility, creativity and self-management during the process. Keeping records of the meetings with, and feedback from, users and the client are a good way to help support the evidencing of this.
- Access to appropriate hardware, software and tutorials is required in order forlearners to create bespoke images or customise existing ones.
- Learners will need to access a range of both published and online sources to provide the academic content.

Getting started

This gives you a starting place for one way of delivering the unit, based around the recommended assessment approach in the specification.

Unit 16: Digital 2D and 3D Graphics

Introduction

Introduce this unit by ascertaining the learners' experience with digital graphics (most will be limited to 2D products) and detail the full expectation of the unit's outcomes and the skills (and professional behaviours) it is hoped the learners will develop before its completion.

Use of previous cohorts' work (if available) is a very useful reference for new learners, especially if they compare favourably with commercial examples, as they will inspire and give realistic targets to which they may aspire. Providing well-known examples of 2D and 3D digital graphics is a sound tactic, especially examples from popular media such as film, TV, advertisements and video games.

You may consider measuring initial learner skills by using a simple skills and behaviours audit, permitting the creation of individualised starting points based on prior experience. This would help you manage practical sessions more appropriately, spending limited support time in the most efficient manner. It would be beneficial to learners to deliver content in learning aim C5 in an imbedded manner throughout the programme of learning. You should repeat the audit process at the end of the unit to measure the distance travelled.

You may also consider appointing (or asking for volunteer) learners with more experience to act as classroom support.

Learning aim A: Investigate the purpose and characteristics of digital graphics that are an important part of visual communications

A1: Purpose of and legal requirements for digital graphics

You will detail the purpose and legal requirements of digital graphics. Legal requirements should be relevant to the region in which the course is being delivered although encouraging a wider geographic awareness in learners is recommended. Learning aim A1 should take approximately 4 hours.

- Define the key purposes of digital graphics:
    - Conveying information, messages and meaning to a target audience.
    - Visualise, communicate, verify and evaluate potential ideas to a target audience.

Use of case studies can be particularly helpful here, particularly mixing examples that have been successful and those that have not (for contrast). Common examples could include company logos, video game cover art, film posters, advertising campaigns etc. particularly where a change of artistic direction can be evidenced. These types of activity often give opportunities for open group discussion on the merits (and otherwise) of the digital graphics created and how they were used. Practical activities such as market research are a possibility.

- Present the current and relevant regional legal requirements for digital graphics.
    - This should at the minimum include those covering privacy, accessibility, copyright, designs and patents. Particular emphasis should be placed on the adapting of digital graphics, including derivative use.
    - Generate learner-driven group or round-table discussion using relevant case studies.

- The use of classroom 'courts' with learners role playing the various parts (defendant, prosecution, defence, jury, expert witnesses) and you as the Judge can be particularly effective when paired with the legal frameworks relevant to this subject (see specification for recommended list).
- You should cover legal requirements that are appropriate to the region in which the course is delivered, as well as any international considerations in relation to intellectual property that are inherent due to the use of IT.

A2: Representation and applications of 2D and 3D digital graphics

You will explore the differences between raster and vector-based 2D graphics and their applications. Learning aim A2 should take approximately 7 hours.

- Demonstrate differences between raster and vector-based images through the creation and manipulation of images using commercial software, encouraging learners to note new terms they encounter.
- Learners should investigate and document the different principles, structures and features of each format (as listed in the specification), considering the relative advantages and disadvantages of raster and vector in different contexts.
- Learners should find examples of different commercial uses of vector and raster- based images, presenting their findings to their peers.
- Learners could create a logo for a defined purpose using vector and raster-based tools. You should ask them to perform certain transformations on these images, e.g. scale, rotate and shear to view the impact on the image's fidelity, file size etc.
- You will introduce the principles and applications of representing 3D images in digital format, including geometric theory, mesh construction, rendering, application, usability and accuracy.
- Demonstrate the creation of a 3D image using commercial software, encouraging learners to note new terms they encounter, particularly in terms of geometric theory and mesh construction.
- Present a number of everyday objects that learners can decompose into simple geons, encouraging them to describe these objects in a professional manner using the correct geometric vocabulary.
- Demonstrate the use of different rendering techniques to change the 3D model's appearance. Ask learners to make judgements about the effectiveness of the different techniques used.
- Learners should find examples of different commercial examples of 3D digital graphics, presenting their findings to their peers (this could be done as a scavenger hunt covering a range of media). Where possible, learners should be encouraged to investigate examples from a range of media and different periods of development. Supplement this activity with demonstrations of previous learners' 3D model work, commercial meshes etc.
- Lead a group discussion to complete the topic that questions the impact of the 2D and 3D digital graphic representation principles on their usability and accuracy. Selection of specific case studies (particularly technically flawed ones) may prove useful to illustrate points raised.

A3: Hardware and software tools for digital graphics

- You will establish the range of software and hardware tools commonly used in the development of 2D and 3D graphics, specifically those that capture processing images internally and outputting them on screen or paper. Learning aim A3 should take approximately 5 hours but it is possible to save some time by combining with Unit 1's

Assessment Outcome area A1 – *Digital devices, their functions and use*.

- Lead a practical session to capture, process and output digital images using digital devices. Personalisation will allow learners to capture images from their own Smartphone cameras. Capturing a real-world texture (e.g. real brick wall) for use as a texture on a suitable 3D model is a good practical activity that involves a mix of different hardware devices and software.
- Learners should also make practical use of different types of software applications to manage and manipulate the images they have captured, e.g. vector-based and raster-based 2D models, 3D models, image gallery and file conversion.
    - Learners should review the produced digital images in open discussion, examining the impact that the choice of hardware and software tools had on the usability and accuracy of the image. Encourage the learner to link between choices made to quality of outcomes, e.g. low capture resolution or high compression rates leading to a degraded, blocky image which lacks definition.

Learning aim B: Design 2D and 3D digital graphics products to meet a client brief

B1: Planning digital graphics

Lead class discussion that encourages learners to think about the processes and techniques to consider when planning the production of digital graphics. Learning aim B1 should take approximately 3 hours.

- Issue learners with a client brief from a suitable case study.
- Ask learners to consider the source of the specification.
- Explore different techniques for generating ideas, e.g. brainstorming, presenting ideas using mood boards, storyboards and thumbnail sketches. Where possible get learners to respond to sample briefs/scenarios to contextualise learning.
- Discuss the technical (as well as the aesthetic) characteristics that define an image's inherent quality, e.g. resolution and compatibility.
- Ask learners to give an overview of the different processing and editing techniques that they think would be required to produce the target image. It is important to support this with reference to the practical skills that they will be developing throughout the programme of learning.
- Discuss the various file and compression formats, selecting (with justification) the most appropriate for the task at hand. You should explore a range of formats that offer lossy and lossless compression and why each would be appropriate in a range of contexts.

B2: Design documentation for digital graphics

You will detail the documentation that learners need to generate for their digital graphic designs. Learning aim B2 should take approximately 5 hours.

Learners typically have to be convinced that documentation is an important part of any design, completed with the same level of care and attention as the digital graphic. This fact is not limited to digital graphic work so the need can be thematically linked to other disciplines, for example, computer programming. Each learner should be aware of the items that comprise design documentation for the subject, knowing how to generate each aspect professionally and its defined purpose.

- Walking learners through a model set of documentation produced for a client brief is a good starting point. The use of previously completed learner work is often very illuminating and can help set the bar for new learners.

- Getting learners to use example design documentation in practical activities to create images is a good way to show learners the importance of the detail needed. Consider providing learners with incomplete or poor quality design documentation that they have to use to inform the creation of an image for a given purpose. You can then discuss the difficulties they encountered when trying to create an appropriate product.
- Demonstrate the different elements that form part of the design's documentation, e.g. client brief, research, themes and aesthetics, legal and ethical considerations, reference imagery, mood board, design sketches, ready-made assets used etc.
- Give learners guidelines for documentation elements such as file naming, storage location, intended platform, hardware and software requirements.
- Using sample client brief(s), allow learners to problem solve and design a solution within a set time limit after which they can then present their efforts. In terms of formative assessment, focus on the presence, depth and range of the documentation elements produced more than the actual quality of designs (for now, as these will almost certainly improve through the programme).

B3: Digital graphics processing and techniques

Introduce learners to the concepts of digital graphics processing and techniques. Learning aim B3 should take approximately 6 hours.

- Prepare an interactive resource or video that demonstrates each processing and editing technique with a 'before' and 'after' view of the digital graphic, e.g. pre- and post-free-hand rotation.
- Demonstrate different compression techniques (lossless and lossy) and their impact on image fidelity and file size.
- Discuss the user experience in terms of quality, compatibility, usability (particularly mindful of purpose and visual disabilities, e.g. graphics for user interfaces), hardware and software requirements.

B4: Reviewing and refining designs

Help learners to review and refine their designs. Learning aim B4 should take approximately 5 hours.

- Ensure learner communication skills are at the appropriate level before tackling this outcome. This should include all popular forms of communication, e.g. letter, email, telephone call, voice or video conferencing and personal interview. Remember to place additional emphasis on non-verbal communication, especially when learners are receiving feedback from the client.
- Discuss techniques for gathering feedback from clients and users, e.g. email, interview, surveys, monitoring social platforms and usability tests. Where possible clients should not be directly associated with the programme; internal clients from within the institute are an acceptable substitute. Leveraging social media is a good way to engage with local companies to find suitable learner-friendly client briefs.
- Arrange, moderate and support client/learner role play that aims to encourage learners to accept constructive feedback from stakeholders and refine their designs accordingly.
- Ask learners to update their design specifications based on the feedback received.
- Review the changes made.

Learning aim C: Develop 2D and 3D digital graphics products to meet a client brief

C1: Tools and techniques for developing digital graphics

You will facilitate the learner's ability to use appropriate tools and techniques to create 2D and 3D digital graphics. Learning aim C1 should take approximately 20 hours plus additional self-study to hone skills appropriately.

- Learners should be given time to develop their graphic editing skills. This could be achieved through a combination of focused class activities, to teach specific techniques, workshops that are more open and explore wider concepts, as well as self-directed study using online tutorials or other similar materials.
    - Introduce each tool and technique for 2D and 3D graphics (as listed in the specification), explaining its purpose and application. If you have time you may enrich this suggested list.
    - Give instruction and/or written, video, pilot/navigator-style support for each learner as they prefer. Issue an ILP to each learner with individualised targets.
    - Monitor and support learners throughout, utilising trusted classroom assistance as necessary.
    - Allow learners to upload their resulting efforts to a class-accessible gallery.
    - Moderate peer critique on each learner's effort.
    - Record helpful tips collected by learners when using the tool/technique.
- Skills such as the ability to freehand draw can be difficult to encourage and develop in IT learners but with persistence most learners attain a reasonable level; the use of graphic tablets may be preferable for some, offering a viable alternative to the scanning of traditional hand-drawn imagery.
- Creating a checklist of the standard skill set for 2D image creation and manipulation is generally a good idea, supported through online tutorials (VLE or web-based), which learners can practise at their own pace and even in their personal time; not all learners will accumulate these skills in the same order or pace so flexible delivery, perhaps learner-led, is a useful option.

Conducting live demonstrations is a sensible way to introduce new techniques but there is undeniably some advantage in advocating a rotating pilot/navigator-style arrangement with learners taking time in supporting their peers' development. Using video tutorials created by other learners affords another fun and totally different alternative to formal instruction.

C2: Reviewing the final 2D and 3D digital graphics products

You will lead and moderate reviews of final 2D and 3D digital graphics by the learner, learner peers, their clients and other interested parties. Learning aim C2 should take approximately 3 hours.

- Learners produce a gallery (physical or electronic) of their 2D and 3D work.
- Invite open critique from learner peers, clients and other stakeholders.
- Incentivise, promoting 'Digital artist of the week' awards (or real prizes) to recognise exceptional performance, for example.
- Learners should personally review each 2D and 3D artwork they have created using the recommended checklist (see specification) and feedback from others. They may consider:
    - measurement against the brief/client requirements

- the overall quality of the image/model
- any pertinent constraints (legal/ethical or technical, for example, formats, polygon count and texture map sizes)
- the level of optimisation that have been applied.

You should expect learners to use technical terms correctly during the provision of feedback. Do not forget to tease other judgements about the digital graphics from the learners including its perceived strengths, weaknesses and how it can be improved (from a technical standpoint and in order to correctly fulfil the client brief).

- Learners should recommend improvements that could be made.
- Ideally, learners' work could also be put on display at key locations around the institution and a retrospective exhibition of the best work organised at the end of the programme.
- Where possible and permissible, keep copies of a range of learners' work to use with next cohort.

C3: Professional behaviours

Help learners to reassess their professional behaviours. Learning aim C3 should take approximately 2 hours.

- You should now reissue the skills and behaviours audit completed by learners in the first session so that they can revisit the document and make additional observations about where and how they feel they have improved. Learners may also find it useful to reference their ILPs when completing this task.
- Throughout the learning aim, ask learners to self-reflect on their performance and their overall approach to the tasks that they completed. You could encourage them to use tools such as SWOT analysis to identify their strengths and any areas for improvement.
- It will benefit learners to maintain a diary or take notes as they complete the various practical activities in the lessons relating to this learning aim. They should also note the comments that their peers make when they give feedback.
- Learners should use the internet (or the centre's own learning centre resources if any exist) and identify sources such as videos or other materials that would help them to improve the skills they identified as needing improvement. A combined list of resources from all learners should be published and/or shared by the class.

Details of links to other BTEC units and qualifications and to other relevant units/qualifications

Depending on the choice of project, the following units will provide useful underpinning knowledge and skills that can be drawn on to create the deliverables:

- *Unit 6: Website Development*
- *Unit 7: Mobile Apps Development*
- *Unit 8: Computer Games Development*
- *Unit 14: Customising and Integrating Applications*
- *Unit 17: Digital Animation and Effects*

Resources

In addition to the resources listed below, publishers are likely to produce Pearson-endorsed textbooks that support this unit of the BTEC Internationals in Information Technology. Check the Pearson website (http://qualifications.pearson.com/endorsed-resources) for more information as titles achieve endorsement.

Textbooks

Blain JM, *The Complete Guide to Blender Graphics* (Third Edition), CRC Press, 2016 (ISBN-10 1498746454, ISBN-13 9781498746458) – Delving deeper into the process of creating 3D models in Blender.

Dabner D, Stewart S and Zempol E, *Graphic Design School* (Fifth Edition), John Wiley & Sons, 2010 (ISBN-10 0500291438, ISBN-13 9780500291436) – Focuses on principles of good graphic design.

Derakhshani D, *Introducing Autodesk Maya 2016*, John Wiley & Sons, 2015 (ISBN-10 1118862848, ISBN-13 9781118862841) – Introductory text with good examples of working with industry-popular 3D software.

Faulkner A and Gyncild B, *Adobe Photoshop CC Classroom in a Book (2014 release)*, Adobe Press, 2014 (ISBN-10 0134308131, ISBN-13 9780134308135) – A primer for working with raster images using industry-standard software.

van Gumster J, *Blender For Dummies*, John Wiley & Sons, 2015 (ISBN-10 1119039533, ISBN-13 9781119039532) – Getting started building 3D models in Blender; assumes no prior experience.

Team, Adobe Creative, *Adobe Illustrator CS6,* Peachpit Press, 2012 (ISBN-10 032182248X, ISBN-13 9780321822482) – A primer for working with vector images using industry-standard software.

Journals

Computer Arts Magazine

ImagineFX Magazine

3D World Magazine

Videos

For useful tutorials, visit YouTube and search for:

'Adobe Photoshop Tutorials' 'Blender 2.7 Tutorial series'

'Maya How-Tos'

'Beginning Illustrator: Vectors vs. Pixels explained'

Websites

Autodesk Maya 3D: professional 3D computer modelling and animation software.

Open Source 3D creation suite: free downloads, FAQ, user community, user galleries and tutorials.

Creative Skillset: works with the UK's screen-based creative industries to develop skills and talent, from classroom to boardroom, supplying advice, industry news, information on courses and job roles.

GIMP – GNU Image Manipulation Program: a cross-platform image editor available for GNU/Linux, Mac OS X, Windows and other OS; free downloads, news, documents and tutorials.

Inkscape: an open source professional vector graphics editor for Windows, Mac OS X and Linux; free downloads, user community, FAQs and tutorials.

Pearson is not responsible for the content of any external internet sites. It is essential for tutors to preview each website before using it in class so as to ensure that the URL is still accurate, relevant and appropriate. We suggest that tutors bookmark useful websites and consider enabling learners to access them through the school/college intranet.