Guidance for Primary and Secondary teachers on the scope and use of digital media in the teaching of art, craft & design

This guidance has been produced by a Special Interest Group of NSEAD members, to support teachers and subject leaders in determining how creative digital technologies might best feature in their art and design curriculum and in day to day lessons. It updates but does not replace previous guidance on digital entitlement and examples of good practice.

This guidance also clarifies the potential scope of the digital elements of a wide ranging art and design curriculum. It does so in the context of the past 30 years and current evolution of digital technologies and student expectations for access to digital media and the increasingly variable level of teacher experience and skill with digital technologies. We must also acknowledge the wider context of changes to school curricula, including the Ebacc and other funding pressures that increasingly limit the scope of experiences that schools can afford or even choose to provide.

The guidance on **Planning the Digital Art & Design Curriculum** and **Digital Art & Design Audit** should assist a teacher or subject leader, to review their current provision and determine actions to improve/broaden the digital content of their art & design curriculum.

Reflecting on the historic and current scope of digital technologies in art & design sets out contextual information to understand the background to digital media technologies in art & design and to help teachers plan for the future. Whilst we are at present without a statutory model of digital entitlement, teachers will need to be guided by their assessment of learning needs, curriculum opportunities and NSEAD's digital curriculum guidance: Entitlement to ICT in secondary art and design (see separate document)

Reflecting on the historic and current scope of digital technologies in art & design

Computers have been in use in art, craft and design education since the mid 1980's, mainly as a tool to expand the breadth of creative opportunity on offer to pupils. Early drawing and painting programs enabled mark making using simple digital tools for drawing lines, shapes, marks and adding colour. Mores ophisticated image manipulation rapidly developed and by the late 80s this included tools for digital photos, surface scanning, copy and paste, changing scale, stretching, distorting and the application of filters which apply visual 'treatments' of the image to 'mimic' conventional media techniques e.g. charcoal, ink-pen, wash, watercolour, impasto, texture etc.

Digital drawing

The means to form the mark or line began with very simple keyboard control in the early 1980's, before quickly developing into the use of a 'mouse', which could record simple hand movements and freehand shapes. Drawing with a mouse proved cumbersome and lacked gestural qualities, requiring control and skill to achieve expressive qualities. Over the last 20 years, graphics tablets have developed quickly and become much cheaper, functioning like a second mouse and featuring the essential characteristic of pressure sensitivity, which enables a wide range of more expressive marks and gestural qualities, particularly when linked to suitably flexible painting software. These tools mimic the function of a sketchpad, but require the user to look at the computer screen and not at the surface of the tablet while drawing. These developments predate the iPad and android tablets, where you now use your finger or a digital 'pencil' to work directly onto the tablet screen, with flexibility and wireless connectivity. Graphics tablets by companies such as Wacom and Serif, still retain a very useful function if you want a cost effective means to rapidly input expressive and gestural marks into any computer, prior to further manipulation.

Image quality, functions and tools

As image quality improved over this 35-year period, there has been a steady increase in the range of tools and filters to enable digital images to 'impersonate' some of the visual characteristics of 'real' or physical art and design media and creative techniques. From the outset, these typically included tools such as *cut/copy and paste*, layering and rotation to create repeat pattern designs for paper or textile print activities, in both virtual and physical form. These developments were also supported by a

parallel evolution in digital printer technologies enabling teachers to print using e.g. ‘sublimatic’ inks (via a replacement ink cartridge for colour inkjet printers), to create a ‘hot-iron’ stencil for printing onto fabric. In addition, half-tone filters enabled the creation of photo-stencils using a laser printer to print to acetate and light sensitive film or emulsion to create the photo image stencil for silk-screen processes. These creative actions were supported by CMYB (cyan, magenta, yellow and black) filters and inks to isolate colours when making stencils, or reproduce full colour prints from on-screen designs.

Alongside these developments, commercial products appeared, enabling digital images to be applied as a stencil or decal to both two and three-dimensional surfaces e.g. Lazertran, or sublimatic inks could be used in an inkjet printer to print an A4 image in reverse, which could then be hot ‘ironed’ to transfer the image onto fabric surfaces. Cut/copy and paste could equally be used in a 3D context with a digital eraser and an art program that supported working in ‘layers’, to create a virtual sculpture. Photographs of a constructed ‘maquette’ or even a digital drawing could be manipulated and pasted into photographs of a site where the virtual sculpture is displayed. Filters enable the treatment of surfaces and the creation of false shadows can simulate a sense of false reality





Top 3 images
Wendover Middle School, Buckinghamshire
Y6 experiments in digital imaging on *Identity*, as part of an artist residency with Andrew Christ – Digital Artist.

Lower 3 images
Training examples by Ged Gast, to illustrate how to use digital technologies and ‘layering’ to create photo montage, virtual sculpture and digital painting.

3 images to the right
Sarah Bell – Artist in Residence to Berkshire CC 1991-1994
Repeat Patterns Designs, to model how the use of digital edit tools to select and edit motifs in Textiles design (Ogee, Half-drop and Rotate).

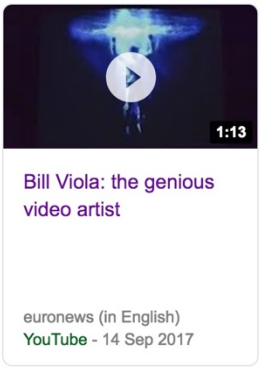


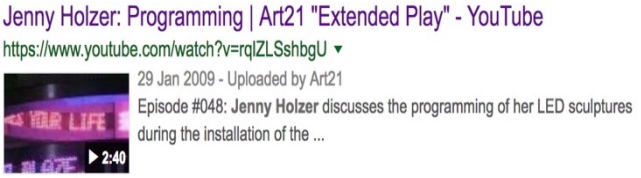
Alongside the evolution of visual digital technologies, the improvement in digital photography and digital darkroom technologies has had a significant impact in art and design. Digital image capture started with video digitisers, scanners and visualisers, which eventually resulted in high-quality digital cameras, which have become ubiquitous and relatively cheap.

The software to exploit these quality improvements has also evolved significantly over this period, with expanding flexibility and creative opportunities that enable users to draw, design, create for print and hard copy output, as well as for virtual purposes and including e.g. web design, animation, film editing, games design, 2D and 3D design imaging, multi-media installation, projection, screen based viewing and virtual reality/immersive technologies. The move from analogue to digital technologies over this period, has also meant that we can combine image, sound and haptic manipulation technologies into multi-sensory works, linking to study in other areas of the curriculum in the arts, science and technology, or as we see used by contemporary artists to make multi-sensory works, immersive installations and generative art.

Over this 35-year period, we have variously referred to the use of computer technology in the art and design curriculum as ‘computer art’, ‘IT’, ‘ICT’ and ‘new-technologies’. This is now commonly called ‘digital technology’ or ‘digital media’. Digital media in all the various forms are used by artists, craftspeople and designers as either their principle creative tool, or seamlessly alongside traditional processes and techniques, to broaden creative opportunities and enable access to complex processes through desktop and mobile technologies. Over this same period, we have also seen the development of new art forms that are entirely digital in production, output and dissemination.

Contemporary artists working in the area of multi-sensory and immersive installations include, for example, William Kentridge, Bill Viola or Jenny Holzer. Links to video examples are below.





- William Kentridge https://www.youtube.com/watch?v=m1oK5LMJ3zY
- Bill Viola https://www.youtube.com/watch?v=xArFDtN3B2M
- Jenny Holzer https://www.youtube.com/watch?v=rqlZLSshbgU

Digital media in the creative industries

The creative and media industries have been at the forefront of these developments, particularly in the context of web design, digital print, advertising, time-based media, including 2D and 3D animation, film and computer generated imagery (CGI). Britain is probably still a world leader in the creative use of many of these digital technologies and our FE and HE sectors offer course programmes that suitably target the career opportunities that currently exist or are coming into existence. Some of these technologies are finding their way into the classroom in forms that enable teachers to offer an example of industrial quality creative processes within art and design activity i.e. digital photography and digital imagery. Developments in high-quality printing and hand-held/mobile devices has also brought creative opportunity within the scope of pupils of all ages. Increasingly powerful software and even tablet ‘apps’ (applications), now enable a pupil to create and manipulate images, or design and make creative outcomes which can be viewed, printed or posted straight onto the web.

Interactive technologies and programming

In all the examples of digital imaging mentioned so far, there has been little reference to computer programming and computer science. Within art and design, these aspects are possible areas for development in those wishing to engage in games design, animation, interactive technologies and web design, to name just a few. There are some areas of creative digital technology, where students might need to know how to program and write code, so that they can design and create digital products. This does not mean that all teachers will need to know how to code, or teach code. What

they might need to do is facilitate such learning, guide a student's investigations and offer their experience as a teacher to ensure the correct quality in a student's outcomes.

These technologies continue to transform the world of work and the creative industries, but the increasing cost of maintaining hardware and the software licenses is beginning to place some, or even many of these technologies, beyond the budget of many schools and well beyond the experience of some teachers.

Boys and digital media

Research exploring both the reasons for boys' lower achievement, or the lower percentage of boys opting to study art and design post 16, identify the lack of opportunity and experience with a particular range of media as a common factor. The lack of access or opportunity to use digital media, is a leading common factor identified by Ofsted, teachers and pupils themselves.

The cost and suitability of digital technologies for the artroom

The introduction of 'Smart' phones and 'Tablet' devices have similarly opened-up opportunities, particularly because of their ease of use and familiarity. Apps to run on these devices are relatively cheap and the technologies have become intuitive, removing the barriers of technical know-how that had prevented some teachers from getting involved. However, the cost of a class set of iPads/tablets and their suitability in providing the total digital experience for students over the school age range, presents a different set of challenges and this is not one that most schools are prepared to tackle or to fund. The cost of laptops compared to tablets can be an issue, depending on specification. Laptops are certainly more flexible and powerful, enabling a greater range of uses, but this is balanced against the higher cost of the software. Screen size can also be an issue with any of these devices. In art and design and as a rule, we have sought larger screens and more powerful processors to handle the demands of graphics processing, compared to almost any other school department. A factor rarely considered when schools are planning their ICT investment strategy. However, this is less of an issue these days as the quality of all computing devices continues to increase and the quality of screens becomes sharper. It has become more a case of determining the right equipment for the range of functions you wish to use these digital tools for. Likewise, the mobility of tablets and laptops has means we can take these to the point in the art studio where they are needed, alongside the designing and painting activities.

The difficulty we as subject specialists also have when making the case for a school to invest in digital technology, is in ensuring the value of these technologies compared to other areas of the art, craft and design curriculum. We might also question whether the ubiquitous presence of these technologies in society provides sufficient access to the right kind of instruction for all students? Particularly as the changes in the Computing curriculum have seen the removal of digital imaging from their KS3 and 4 curriculum.

Software in the 90s was designed to be school and student friendly and made many of the creative processes and techniques for developing textile designs, virtual sculpture and even animation, much easier to produce than they are now. These software tools had features that performed creative functions in ways that mimicked classroom techniques and even used a terminology that replicated physical art techniques. Software development has polarised in recent years into professional software and amateur software, with the former pricing itself out of the school budget and no longer appearing to make explicit how to integrate some functions into the physical art making process. The latter software has been targeted more at the adult who wishes to create simple changes to photographs, rather than being a serious tool for creative purposes. The move to tablet technologies has brought some benefits in terms of the affordability of software Apps. However, they can have some limitations as without direct connectivity to external devices, or good wi-fi technologies in the classroom, teachers can be limited in the way that these technologies can support practical creative activity.

The cost of maintaining sufficiently high quality computing facilities to enable digital art and design activity, will seem high, particularly at a time when art and design department budgets have been fixed or falling for many years. Many departments running digital photography GCSE might struggle to afford sufficient software licenses for this for KS3 students and many have to make a surcharge for materials and cameras at KS4.

The creative use of digital technologies to explore moral and ethical issues
Art and design teachers have shown the value of the subject when engaging with young people to explore moral and ethical issues linked to Spiritual, Moral, Social and Cultural (SMSC) themes. This is entirely consistent with more traditional approaches to what is often referred to as 'Issues based art'. At present, it would seem that only Computing and PSHE lessons seek to teach children about ethical and safe use of digital media. However, art and design should have a significant role here in teaching children the visual literacy of digital imagery and principles of ethical or truthful design. These were things always previously covered by art and design teachers, when pupils looked at the graphic design of advertising, typefaces and photomontage throughout 20th century art, or how easy it is to create visual lies when we 'Photoshop' an image. Art and creativity are always at their best when young people engage with 'real life' issues, as in the following five examples by GCSE students. A 'games' design to teach other pupils about STDs, an illustration about media control and three animations about body image, the culture of celebrity status and the futility of war.

Gabriella Cerenzia Y11 GCSE
Animation: *Beauty is only Skin Deep*
Chalfonts Community College

Charlotte Haddy Y11 GCSE
Animation: *Celebrity*
George Abbot School

Jordan Searle Y11 GCSE Examination
Graphic Image: *We Want You!*
Chalfonts Community College

Harold Methven Y11
Games design: Barriers - GCSE Exam response to support teaching of facts about sexual health and STDs
Chalfonts Community College

Harold Methven Y11
Kinetic Typography: GCSE Examination response
Chalfonts Community College
View at: https://vimeo.com/275486602

What has changed?
The most significant change in the last 5 years, which has led to an increase in costs to art and design departments, has been the move to Computing from ICT. This has resulted in a return to computer science and programming as elements of the future success of digital learning and their contribution to our creative economy. Although this would appear to be a separate issue to art and design, we know that without programming we would not have games design, areas of generative art and the creative technical understanding needed to manipulate some digital media outcomes. As a consequence, this has led to the removal of teaching image manipulation within the ICT curriculum and with it, school

funding for creative software such as Photoshop and Adobe Creative Suite amongst other software programs. These changes are forcing on schools and specific departments, the need for a decision on who teaches and who funds the creative digital curriculum. The cost to a primary school of art and animation software for example, might exceed their whole art and design annual budget. The same is particularly true in secondary schools, where the cost of maintaining suitably specified computers and the Adobe Photoshop and creative cloud license (the industry standard for many applications), might now exceed the total subject budget, even before adding, high quality printing, cameras, graphics tablets and animation software, let alone a 3D printer or laser cutter/etcher. This may be an issue for those teaching digital photography and those who wish to continue using Photoshop as their software of choice. Other software is available and experienced members should be able to offer current advice on the relative qualities of alternatives in the market, or even 'free' solutions.

Adobe creative cloud provides licenses for devices and users, seeking to ensure the latest version of the software is in place. See more information here (*insert hyper link*):
http://www.adobe.com/uk/creativecloud/buy/students.html

Leading-edge technologies
We are all aware that in recent years, innovations in 3D print and laser scanning, etching and cutting have provided tools for 3D prototyping and manufacture, in textiles, paper, card, plastic, wood and almost any sheet material. Web design and time-based technologies have also enabled a broad range of design for the Internet, interactive works and installations, as well as animation, film and presentation media that enable multi-media outcomes. Artists are at the forefront of the use of these technologies and the creative and digital CGI industries rely on these skills and digital technologies, but more importantly, they rely on the creative and artistic skills these artists possess. What we know is that in the hands of non-artists, these digital technologies achieve little. They require the skills and experience of creative artists to produce the world-class products and creative outcomes for which the UK is famous. The question remains: What actions do we take to ensure we provide a meaningful digital curriculum and experience to our students?

Luizaerc (2012) by Nick Ervinck

From: Artist Nick Ervinck sculpts with bits, bytes, and 3D printing

http://www.3ders.org/articles/20140201-artist-nick-ervinck-sculpts-with-bits-bytes-and-3d-printing.html

Agrieborz by Nick Ervinck
From: Print 3D World - Las esculturas orgánicas de Nick Ervinck

http://www.print3dworld.es/2013/03/las-esculturas-organicas-de-nick-ervinck.html

Examples of 3D print by Nick Ervinck (originally featured in Issue 8 of AD magazine Autumn 2013) a contemporary artist using digital technologies to design and produce 3D printed artworks.

Planning the digital Art & Design Curriculum

The Table below sets out the 3 areas of digital opportunity in the art & design curriculum

Art & design leaders might use this table to help them audit their digital practice to ensure breadth, identify career pathways and creative industry contexts.

NB. Art & design departments are unlikely to cover all three areas, but might cover several aspects of 1 and 2. Schools might also be developing practice in area 3 when and where collaborative opportunities, funding and teacher expertise exists.

1. Evaluating and Reflecting on Digital Practice – Critical and Contextual

Research, analyse and critically understand both traditional and digital art, craft and design:

a. Research and analyse digital artworks by digital artists and designers;

b. Develop Search and researching skills, to enable students to find sources, analyse and evaluate these to inform their creative work;

c. Develop understanding of copyright, legal use and crediting of sources;

d. Develop understanding of digital media for online safety and to become, thoughtful and discriminating consumers and producers. Consider how digital and social media can be used to advertise, promote and communicate in honest, positive, celebratory ways and alternatively to misrepresent, mislead, bully, distort or manipulate reality.

2. Making Art, Craft and Design – Digital Imaging

Creative use of digital media to design and produce, printed, web, screen and projected outcomes that include:

a. Digital photography - image making, image manipulation and Photomontage;

b. Digital production techniques, digital Collage (e-Collage), creating new images from photographic, scanned, drawn or other diverse sources;

c. Digital Graphic Design and the use of image, lettering, font design and text for commercial contexts to advertise and communicate graphically as well as games design, interactive media and web graphics;

d. Digital naratives - cartoons and digital graphical novels or storyboards;

e. Animation using 2D and 3D animation tools (e.g. hand-drawn, Flash, Pixelation, Rotoscoping, Stop-frame and Claymation, 3D software animation, Motion Capture and ‘tweening’);

f. Film, TV and live/studio created digital recording and capture, to create screen or projected narratives and expressive outcomes, green screen and special effects;

g. Digital Installation art that use digitally created and/or digitally delivered content (from any of the above processes);

3. Making Art, Craft and Design – Coding and Control

Computer aided design and manufacture (CADCAM), coding, interactive software and APP design for outcomes that include:

a. Computer coding to create generative art, animations, digital projection, games, web graphics, multi-modal products, interactive screen technologies and new APPs;

b. 3D laser scanning and the manipulation of virtual 3D forms using software and supported by e.g. Haptic[i] design tools prior to either image output to screen, projection, print or product;

c. Computer Aided Design and Computer Aided Manufacture CAD CAM – e.g. 3D printing, laser cutting and engraving for sculpture, textiles, paper/card construction;

d. Robot assisted painting – using computer programming/coding to control art making devices that generate virtual and tactile outcomes or products;

e. Computer programmed and/or interactive art installation.

[1] Haptic Design Tools use a form of tactile feedback technology, applying forces and vibrations to enable the user to virtually touch, feel and manipulate what is on screen to stretch, squash, pinch and press a virtual form into shape.

Digital Art & Design Audit - Primary

The following Audit questions will help in providing a focus on provision and curriculum breadth. There are spaces where you can record a judgement and draft possible development priorities and actions.

Self-audit questions for primary art and design coordinators who wish to consider computing/digital skills and competencies

The Primary Digital Curriculum

In Primary schools in general over the past 10 years, we have seen a change in emphasis on art and design as a consequence of the emphasis on core standards and the perception of subject value promoted by the EBacc. The digital curriculum remains important in developing skills and wider understanding of how these technologies apply to diverse careers and industries.

Primary art and design coordinators should question and reflect on whether:

- Curriculum provision is in place to ensure children learn about digital media and can use these technologies to make art, craft and design outcomes.
- The school has suitable provision to support this learning, and that teachers have the knowledge and skills to facilitate this.

Audit/self-review question	Judgement of existing provision			Actions / possible development
	strong	**adequate**	**weak**	
Curriculum and Outcomes				
9. There are suitable opportunities for pupils to use digital technologies as part of their art and design curriculum experience (in each key stage) to draw, design and make images using digital technologies;				Actions: Who: Date: Outcomes/success:
10. Pupils understand how to create and modify digital content to create new visual works;				Actions: Who: Date: Outcomes/success:
11. The quality and breadth of digital outcomes, enable young people to become confident and familiar with digital thinking and creative digital activity;				Actions: Who: Date: Outcomes/success:

Accommodation, Equipment and Resources		
12. Your school network has suitable software installed to support creative visual activity and teachers have access to digital equipment and resources that will enable inputs from digital sources and digital outputs or in hard copy forms for presentation, celebration and display;		Actions: Who: Date: Outcomes/success:
13. Periodic discussions with the ICT or Computing coordinator in your school ensures resources, equipment and software are suitable and relevant to the creative needs of your planned curriculum and support is available to ensure provision is effectively used.		Actions: Who: Date: Outcomes/success:
CPD: Staff development and training		
14. As a coordinator, you and classroom teachers have suitable digital understanding (or have received CPD) to enable confidence with planning of relevant activities and the use of digital technology in creative art and design activities;		
Conclusions / summary points for school development/action plan		
▪ ▪ ▪		
Comments to support this audit from ICT Coordinator/Head of computing:		

Date: Teacher:

Digital Art & Design Audit - Secondary

The following Audit questions will help in providing a focus on provision and curriculum breadth. There are spaces where you can record a judgement and draft possible development priorities and actions.

Self-audit questions for secondary art and design teachers/subject leaders who wish to consider computing/digital skills and competencies

The Secondary Digital Curriculum

In Secondary schools in general over the past 10 years, we have seen a change in emphasis in the digital curriculum, largely in response to 6 factors. These are:

1. Reduction in departmental budgets and financial cuts to schools;
2. Ageing digital equipment within the department or accessible to the subject;
3. Changes to the whole school computing curriculum and consequently a loss of access to high quality image manipulation and creative software;
4. The perception that Computing is cross-curricular and departments are supported by a computing coordinator, alongside the provision of computing facilities, paid for out of a whole-school budget;
5. A shift to digital photography which has focused the creative digital curriculum in one particular direction;
6. Changes in teacher experience and knowledge in the use of digital technology – access to relevant CPD.

Secondary art and design teachers should question and reflect on:

- The curriculum provision in place and how well it ensures that students learn about different forms of digital media and can consider the impact of digital technologies on society and creative industries.
- The opportunities for student's to use these technologies to make art, craft and design outcomes.
- The suitability and quality of both the department and school's provision/resources/budget to support this learning.
- The suitability and quality of teacher's knowledge and skills to facilitate this.

Audit/self-review question	**Judgement of existing provision**			**Actions / possible development**
	strong	**adequate**		**strong**
Curriculum and Outcomes				
1. There are suitable opportunities for students to use digital technologies as part of their art and design curriculum experience in KS3, to draw, design and make and manipulate images using digital technologies;				Actions: Who: Date: Outcomes/success:
2. Students on examination programmes have suitable access to relevant digital technologies. This enables them pursue their interests and areas of creative expression using the digital technologies within your provision, to gain the best quality outcomes possible and gain suitable examination success;				Actions: Who: Date: Outcomes/success:
3. Students have opportunities to use digital cameras to				Actions:

record, process and make creative outcomes for still (photography) and/or time-based (film) processes;		Who: Date: Outcomes/success:
4. Students understand how to create, modify and repurpose digital content to create new visual works, and for different modes of presentation, production and outcome;		Actions: Who: Date: Outcomes/success:
5. Students are developing more complex and challenging levels of skill and understanding that include one or more of the following: Coding, Animation, Generative Art and multi-media installations/interactive works, Applied Design (3D printing, laser cutting/etching, web design);		Actions: Who: Date: Outcomes/success:
Accommodation, Equipment and Resources		
6. Your school network, faculty/ department computer facility (including tablets/laptops) has suitable software installed to support creative visual activity and teachers have access to digital equipment and resources that will enable inputs from digital sources and digital outputs, or in hard copy forms for presentation, celebration and display;		Actions: Who: Date: Outcomes/success:
7. The quality and breadth of digital provision, enables young people to become confident and familiar with digital thinking and creative digital activity.		Actions: Who: Date: Outcomes/success:
8. Periodic discussions with the ICT or Computing manager in your school ensures resources, equipment and software are suitable and relevant to the creative needs of your planned curriculum and that support and CPD is available to ensure provision is effectively used, well maintained and fully complies		Actions: Who: Date: Outcomes/success:

with health and safety guidance.		
CPD: Staff development and training		
15. As a group of specialist teachers of art, craft and design, you and any non-specialist colleagues have suitable digital understanding (or have received CPD) to enable sufficient confidence when planning and teaching relevant activities using digital technology;		Actions: Who: Date: Outcomes/success:
16. Are there areas of digital development that members of the art and design team are qualified in, or have suitable experience, but are not yet included in your curriculum? Why is this?		Actions: Who: Date: Outcomes/success:
Conclusions, summary action points or recommendations for a development plan		
▪ ▪ ▪		
Comments to support this audit from ICT Coordinator/Head of computing:		

Date: Teacher:

Department