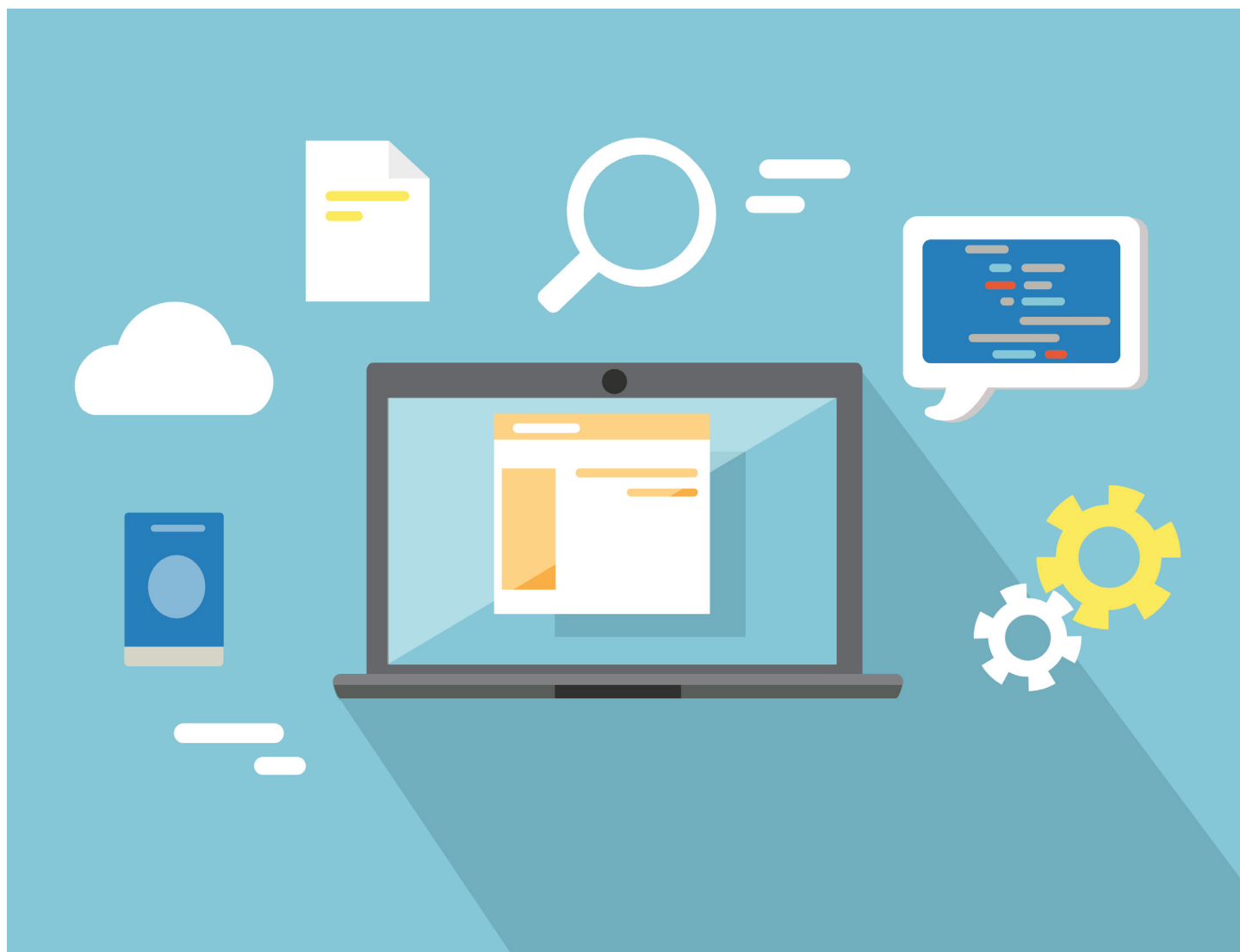# Preparing for the Digital Competence Framework (DCF)

July 2018

The purpose of Estyn is to inspect quality and standards in education and training in Wales. Estyn is responsible for inspecting:

- ⅄ nursery schools and settings that are maintained by, or receive funding from, local authorities
- ⅄ primary schools
- ⅄ secondary schools
- ⅄ special schools
- ⅄ pupil referral units
- ⅄ all-age schools
- ⅄ independent schools
- ⅄ further education
- ⅄ independent specialist colleges
- ⅄ adult community learning
- ⅄ local government education services for children and young people
- ⅄ teacher education and training
- ⅄ Welsh for adults
- ⅄ work-based learning
- ⅄ learning in the justice sector

Estyn also:

- ⅄ provides advice on quality and standards in education and training in Wales to the National Assembly for Wales and others
- ⅄ makes public good practice based on inspection evidence

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Introduction

This report is written in response to a request for advice from the Welsh Government in the Cabinet Secretary's annual remit letter to Estyn for 2017-2018. The report focuses on how schools are beginning to ensure that pupils develop their digital competence as set out in Successful Futures (Donaldson, 2015). The report identifies examples of innovative and interesting practice in how schools are preparing for the digital competence framework (DCF). It will provide the Welsh Government and other stakeholders with an overview of the preparation that these schools have made about a year after the DCF was made available to schools. This report covers the DCF and therefore does not address issues regarding the different information technology (IT) policy that exists post-16 or transition between them.

The report is intended for the Welsh Government, headteachers and staff in schools, and for local authorities and regional consortia. The findings of the report are based on visits to 23 schools identified as schools with 'good practice' in preparing for the DCF, seven of which are Digital Pioneer schools. During the visits, inspectors scrutinised curriculum plans, held discussions with the teacher responsible for DCF and with other teachers, senior and middle leaders, interviewed pupils, and scrutinised pupils' work. Evidence to support the report was also gathered during school inspections that took place during autumn 2017.

The report shares practice and approaches that other schools may consider emulating as part of preparing for the DCF. The report will help schools to understand their current strengths and areas for improvement, as well as understanding possible changes that need to be made within leadership or provision to realise the full potential of the DCF. The report contains self-evaluation questions that can be used by schools to monitor and review their digital competence provision.

Background

In January 2013, the Welsh Government established an independent ICT Steering Group to consider the future of computer science and information and communication technology (ICT) in schools in Wales. This group was asked to identify a way forward to improve ICT provision in schools. The ICT Steering Group's findings were published in September 2013 and laid out recommendations (Arthur, Crick & Hayward, 2013), including the recommendation to produce a digital competence framework with the same standing as the literacy and numeracy framework (LNF) (Welsh Government, 2013). Estyn's 'ICT at key stage 3' report (Estyn, 2014) recommended that the Welsh Government should implement a statutory framework for ICT from foundation phase to post-16 and review the National Curriculum subject orders to reflect current developments in technology.

In March 2014, the then Minister for Education and Skills asked Professor Graham Donaldson to conduct a fundamental review of curriculum and assessment arrangements in Wales. The resulting report, Successful Futures (Donaldson, 2015), outlines proposals for a new curriculum that builds on the strengths of Welsh education. The report identifies four purposes for the curriculum and recommends that the curriculum should be based on six Areas of Learning and Experience. It also proposes that three cross-curriculum responsibilities (literacy, numeracy and digital competence) should be embedded within the areas of learning and experience.

In October 2015, the Welsh Government published 'Qualified for Life – A curriculum for Wales – a curriculum for life' (Welsh Government, 2015a). This document sets out the steps that will be taken to achieve Successful Futures (Donaldson, 2015).

Successful Futures (Donaldson, 2015) sets out the need for a DCF. Welsh Government accepted this rationale and recommendation. A key step in the development of the DCF was identifying digital pioneer schools to lead on the creation of the framework. The involvement of digital leads from the regional consortia, along with Estyn representatives, and the advice of a quality assurance group of international experts in the field, also contributed significantly to the process. The timeframe for creating the DCF is set out below:

- June 2015 – the Minister for Education and Skills announced that a DCF should be 'fast-tracked' for availability in schools by September 2016.
- July 2015 – Digital Pioneer schools announced.
- September 2015 – work on developing the structure and content starts.
- February 2016 – following an engagement exercise, Digital Pioneers revise the DCF to reflect feedback received.
- June to July 2016 – following a second engagement exercise, Digital Pioneers revise the DCF to reflect feedback received.
- September 2016 – the DCF is available to schools and settings.

In June 2017, the Welsh Government published 'Cracking the Code: a plan to expand code clubs in every part of Wales (Welsh Government, 2017a). It was published to increase teachers' confidence in delivering coding skills and to support progression for learners from primary to secondary and from basic programmes to the more advanced.

In September 2017, the Welsh Government published Education in Wales: Our national mission 2017-21 (Welsh Government, 2017b). This document sets out a national mission and a timeframe to deliver a reformed and successful education system. Central to this mission is:

- ensuring that learners in Wales have relevant high-level digital skills and are digitally competent
- supporting education professionals to utilise the relevant technologies and skills to transform the digital competence of learners
- launching the digital professional learning framework and programmes for schools as learning organisations

Main findings

Leadership

1   In the schools visited, leaders manage change well and have a clear vision about how to prepare for the DCF. These leaders include staff in creating a vision for the DCF and ensure that the governing body understand fully the importance of implementing it well. They communicate their vision clearly with staff. They ensure that staff understand that leaders support the realisation of the DCF fully, and monitor its development carefully.

2   Many of these leaders translate their vision into a comprehensive and practical plan to drive the DCF forward and provide a clear rationale for auditing, training, resourcing, monitoring and evaluating developments. In a minority of schools, arrangements to evaluate the effectiveness of their digital plans are not fully developed.

3   Nearly all these leaders offer effective professional learning opportunities for staff to prepare for the DCF. They ensure that staff have the equipment and opportunities to develop the competence and confidence they need to realise the DCF. A few leaders do not have a good enough understanding of the technical issues that could impact on the school's capacity to realise the DCF fully.

4   Leaders say that they are unsure about when the DCF should be implemented and give this as a reason for some not realising the DCF. There is no explicit realisation date for the DCF, which suggests to some that it will be introduced at the same time as new curriculum, six years after the DCF was first made available. As a result, the DCF could lose impetus.

Role of the digital lead

5   Digital leads in most schools have a thorough knowledge of the DCF. Many teachers value the enthusiasm and support of their digital lead. However, a minority of digital leads have a tendency to create a culture of dependency and troubleshoot technical problems rather than supporting teachers to develop their skills so they can fix these problems themselves. In nearly all instances, the effectiveness of the digital lead is greatest when they have the full support of senior leaders. Digital leads in secondary schools are most effective when they are members of the leadership team or are otherwise able to impact on whole-school decision making.

6   In the majority of secondary schools, digital leads have formed a DCF working group that includes heads of department and teachers from various departments across the school. This approach is effective because it includes a wide range of teachers and ensures that nearly all departments are engaged with the DCF and understand its impact on whole-school developments.

7   In most schools, the digital lead has carried out a hardware and network infrastructure audit to ensure that they are robust enough to deliver the DCF. Most

digital leads audit teachers' skills carefully to evaluate their readiness for the DCF. They use the information from the audit well to plan training, spread over a realistic timeframe. In a minority of schools, the digital lead has not audited the training needs of all teachers, is unaware of their training needs, and cannot plan fully to support staff.

8   In schools that have mapped the DCF across the curriculum, many digital leads have not decided yet how to address the issue of gaps in provision. Mapping of digital coverage and progression is important to ensure that pupils experience the breadth and richness of skills across the whole of the DCF framework. Unless these gaps in provision are addressed, schools are in danger of replicating current inadequate provision in ICT across the curriculum.

9   Too few digital leads in secondary schools have mapped the provision of the DCF across key stage 4. As a result, most secondary schools are not preparing well enough to realise the DCF in its entirety.

Professional learning

10   In around half the schools visited, nearly all staff have been involved in discussing the digital plan for the school. Through their involvement, many staff are aware of the plan's content, what is involved, and the expectations of them. As a result, most teachers have positive attitudes towards preparing for the DCF and feel involved in the developments.

11   Teachers say that they are more confident with the content strands of 'citizenship', 'interacting and collaborating' and 'producing', than with 'data' and 'computational thinking'. This broadly reflects many teachers' knowledge and understanding of the ICT curriculum content. However, digital leads in school and in consortia consider that this assessment is optimistic and in particular they believe that teachers do not fully appreciate the breadth of the citizenship strand.

12   Practitioners in the foundation phase feel competent enough in most aspects of the DCF to enable them to support pupils appropriately. Practitioners in key stage 2 and above are less secure in delivering the full range of digital skills. Most teachers in special, primary, secondary and all-age schools have started to discuss how to adapt long, mid and short-term plans to incorporate the DCF into the curriculum.

13   Where leaders have not communicated their vision successfully enough, a few teachers do not feel involved and have negative attitudes towards the preparation for the DCF.

14   Centres of initial teacher education and training are beginning to equip trainee teachers with the skills that they need to deliver the breadth and range of digital skills required by the DCF. However, the development of students' skills is too variable due to their limited involvement in DCF developments, and to their lack of awareness of the weaknesses in ICT provision in schools.

Recommendations

Schools should:

R1   Involve all stakeholders in developing a clear vision for the DCF

R2   Appoint a digital lead, secure the full support of senior leaders, and monitor developments regularly

R3   Audit teachers' professional learning needs and use this information to plan training, support and guidance over a realistic timeframe

R4   Map the DCF across the curriculum and ensure that there are no gaps in provision and sufficient progression and continuity

R5   Carry out hardware and network infrastructure audits

R6   Ensure that staff collaborate with others to share good practice

Local authorities and regional consortia should:

R7   Support all schools to address the above recommendations

R8   Monitor how well individual schools are progressing with the realisation of the DCF and challenge limited progress

The Welsh Government should:

R9   Communicate clearly to schools the expectations for embedding the DCF, including timescales

R10   Ensure that initial teacher education courses provide new teachers with the necessary skills to realise the DCF successfully

R11   Improve the audit tool so that it better meets the needs of schools in assessing teachers' confidence to deliver the DCF

Effective approaches to preparing for the DCF

Leadership

Vision

15   In the 23 schools visited, many leaders manage change well and have a clear vision about how to prepare for the DCF. They understand the important role that realising the DCF well has in making teaching effective in order to raise standards and improve provision. Successful leaders include staff in establishing and developing the vision. They share this vision well. They do so to ensure that staff understand that leaders support the successful realisation of the DCF, and will be monitoring its realisation and development in a constructive way. In the schools visited, most teachers believe that leaders have shared their vision of the DCF effectively. Many leaders have translated their vision into a comprehensive and practical plan to drive the framework purposefully, and provide a clear rationale for auditing, training, resourcing, monitoring and evaluating its realisation.

16   Effective leaders consult with and include the governing body in key decisions and ensure that the governors understand fully the importance of realising the DCF. In particular, they have emphasised the importance of the DCF as part of a relevant and engaging curriculum that meets the needs of all pupils and that prepares their pupils for the world of work.

17   Leaders say that they are unsure about when the DCF should be implemented and give this as a reason for some not realising the DCF. There is no explicit realisation date for the DCF, which suggests to some that it will be introduced at the same time as new curriculum, six years after the DCF was first made available. As a result, the DCF could lose impetus.

Planning

18   Many schools have suitable self-evaluation processes to support the planning and realisation of the DCF. Plans to develop the DCF prioritise key developments appropriately. In many instances, these priorities are also referenced suitably in the school's improvement plan.

19   In many instances, leaders involve the teacher identified as the digital lead in preparing the plan. In around half the schools visited, leaders involve all staff successfully in the development process. Through this wider involvement, leaders create a whole-school approach that tends to lead to greater commitment from staff. As a result, most staff have positive attitudes about DCF developments.

20   The quality of these plans is generally good; they are clear and include:

- realistic timeframes
- clear accountability, including who does what, by when and who monitors the actions

- how and when they will audit the training needs of staff
- how and when they intend to offer training for staff and any costs likely to be incurred
- how and when they will audit the hardware and software needs
- how and when they will audit whether the network infrastructure is sufficient to deliver the DCF

21 A majority of leaders are starting to evaluate the effectiveness of their digital plans rigorously and to hold staff to account for developments. Where evaluation is effective, leaders arrange systematic lesson observations, scrutiny of pupils' work, talking with pupils, and scrutiny of teaching plans. Through these approaches, they identify strengths and weaknesses in standards and provision to help plan for further improvement.

Appointing a digital lead

22 Leaders in all the schools visited have appointed a member of staff with suitable skills to undertake the role of digital lead. Many had done so as early as autumn 2016, with a few in autumn 2015. These 'early adopters' have had the benefit of more time to prepare and have been able to do so in a manageable way, supporting other staff well.

23 Many leaders in the schools visited ensure that the digital lead has regular opportunities to attend consortium events for digital leads so that they can develop in the role and gain valuable ideas and suggestions about how to work most effectively. The professional networks that such events facilitate often offer further support for digital leads as well as an opportunity to collaborate and learn from others.

Professional learning

24 Effective leaders understand the importance of professional learning. They ensure that staff have the equipment and opportunities to develop the competence and confidence they need to realise the DCF. Nearly all leaders in the schools visited offer effective professional learning opportunities for staff to prepare for the DCF and address the learning needs of pupils.

25 Nearly all leaders in the schools that were not digital pioneers understand the benefits of joint working and collaboration between schools, learning from the expertise and experiences of the digital pioneer schools and from the consortia digital leads.

26 In many schools, leaders have started offering opportunities for interested pupils to learn about computer programming and coding to start preparing for the DCF. Many of these schools make effective use of pupil digital leaders to teach and support their fellow pupils and, in some instances, staff in coding clubs.

Resources and equipment

27 Leaders stated that preparing for the DCF has required additional financial resources. Schools started from different points with their hardware, network

infrastructure and training needs and, as a result, school leaders quoted varying costs. Schools that spent over £25,000 had hardware and network infrastructure issues that needed addressing before establishing a programme of training for staff.

28   In previous Estyn thematic reports (Estyn, 2013 and 2014), inspectors found that leaders were increasingly purchasing tablets, rather than laptops or netbooks. Leaders now choose a mixture of tablets and laptop/netbooks as they believe that, while tablets have strengths, they are not always the best tool for the job, especially when a keyboard is needed.

29   Around half the schools that had connectivity issues have addressed these issues and ensured that the quality of the internet connection and the school's network infrastructure is no longer a hindrance to their digital work. They have also ensured that the level of filtering and blocking of internet sites by local authorities does not hinder teaching or learning.

30   A minority of leaders are tackling hardware issues by allowing pupils to bring their own device (BYOD). They do so with a good understanding of the concerns of other headteachers, parents and governors regarding the possible misuse of mobile devices by pupils. As a result, these leaders have clear procedures and acceptable use policies to deal with such issues.

31   A growth in hardware places a strain on Wi-Fi accessibility and can cause unreliable connection. Most leaders have addressed this issue at the outset and there are examples of this in case studies seven and eight.

Digital leads

32   In the majority of schools, the digital lead was previously the ICT lead and in many instances automatically became the lead for realising the DCF. However, this is not always the case and there are worthwhile examples of the digital lead coming from a non-ICT background. Leaders who chose this option give good reasons for taking this course. The chosen individual may have the interpersonal and project management skills to carry forward the work, and some leaders believe that staff might be more at ease with a non-ICT specialist providing cross-curricular advice and guidance. This is often the case in secondary schools. In most instances where this has happened, the digital lead liaises well with the ICT department.

33   In nearly all instances, the effectiveness of the digital lead depends significantly on whether the leadership team is fully supportive of the DCF. Digital leads in secondary schools are most effective when they are members of the leadership team or are able to impact on whole-school decision making.

Raising awareness of the content of the DCF

34   In nearly all instances, digital leads have arranged raising awareness sessions for staff about the content of the DCF. Often these sessions involve sharing materials and video prepared by the Welsh Government. Sessions that offer in-school training help teachers to understand the content of each strand and prepare staff to complete an audit of their skills against the statements of the DCF.

35   A majority of digital leads in secondary schools ensure that heads of department co-operate to secure regular, challenging opportunities for pupils to use their digital skills in meaningful contexts across other subjects. They have started to monitor colleagues' work to ensure that they offer appropriate opportunities for pupils.

36   In a few examples, such as at Ysgol Bro Pedr, digital leads started developmental work with colleagues by checking whether staff are confident that they have sound basic digital skills. They have then checked whether staff have the skills required to deliver all strands of the current ICT curriculum to build upon, before starting on the DCF. Staff involved in this basic training value this peer support, which is offered in a mutually supportive environment where they can learn without fear, and no question is too basic.

37   In a few secondary schools, digital leads and senior leaders establish innovative ways of engaging departments across the school. Case studies 12, 13 and 14 highlight this practice.

38   Digital leads in most schools have a thorough knowledge of the DCF. Most know the content of the strands and elements well and use this knowledge to identify the differences between the DCF and the current expectations for the use of ICT across the curriculum.

39   Many digital leads use their knowledge of the content of the DCF to start upskilling themselves, targeted members of staff, or pupils in some of these new areas. Typically, these areas involve certain elements within citizenship, collaboration, and data and computational thinking. These staff and pupils are then ready to support other staff and pupils as they embark on realising the DCF.

40   The majority of secondary school digital leads in the schools visited have formed a DCF working group of heads of department and teachers from various departments across the school. This is effective in including a good representation of teachers and ensuring that nearly all faculties are fully engaged with preparing for the DCF. This has also successfully raised the awareness of all staff in these departments of their collegiate responsibility in embedding the DCF.

Auditing

41   The most effective digital leads have undertaken a number of audits to help senior leaders to understand the strengths and weaknesses of the school's current readiness to realise the DCF.

42   Most digital leads have carried out a hardware audit in order to find out whether the school's IT hardware is fit for purpose. Where the hardware audit has identified issues, then the digital lead often works effectively with the leadership team to plan a programme of hardware purchase over two or more years.

43   Many digital leads have audited the network infrastructure within the school. This usually involves checking the speed of the internet delivered to the school and the speed with which it is delivered across the school and identifying anything that hinders delivery across the school. At the same time, many digital leads check whether the wireless functionality across the school is robust and dependable

enough to support the growing number of devices that depend on Wi-Fi. A few make effective use of the recent guidance produced by the Welsh Government to help with this issue.

44   Another key audit that many digital leads have introduced is of teacher skills. Most digital leads use the information from this audit well to plan purposeful training over a realistic time frame. However, only a few schools have used the Welsh Government professional learning needs tool (Welsh Government, 2017c) to assess teachers' confidence to deliver the content of the DCF. This is because the majority of schools report that it arrived too late for their plans or it did not identify training needs against each element of each year group well enough. As a result, proactive schools have devised their own audit tool to meet their needs.

45   In very small primary schools, the digital lead often knows each staff member's needs without the need to carry out a formal audit of teachers' skills. However, in nearly all primary schools, the audit has involved identifying which elements of the DCF staff are comfortable with, which they will need some support with and which are completely new to them. The majority use a simple red, amber, green (RAG) rating approach against each element of the DCF that was pertinent for them.

46   In secondary schools, staff often start from a lower digital skills base than their primary colleagues. This is mainly because secondary schools have not offered pupils enough well-planned opportunities to practise their current ICT skills in meaningful contexts across the curriculum. Secondary school ICT departments are generally poor in liaising with other departments and do not provide them with relevant contexts across the curriculum to apply the skills they developed in discrete ICT lessons. As a result, teachers have not often been asked to include purposeful ICT tasks in their subject area and the experience of doing this will be new for many. In these cases, the challenge for digital leads to win the hearts and minds of colleagues and to identify their training needs is therefore greater. Successful digital leads do this well.

47   Identifying professional learning needs for the DCF is also a challenge in special schools, as staff here have to respond to pupils' very specific and specialised individual needs. However, in nearly all special schools the digital leads do this well.

48   After auditing teacher training needs, nearly all digital leads plan relevant training for staff to ensure that they have the confidence and competence needed to deliver the DCF to the pupils they teach.

49   Many teachers in the schools visited comment on the enthusiasm and support offered by their digital lead. They speak highly of the training and the support and how this has enabled them to embrace the challenge of developing their own professional learning related to the DCF. Teachers value the advice given on how to amend planning and the discussions regarding the best ways to embed the strands into the curriculum. They respond well to the training offered on digital skills that are new to them and to the availability of the digital leads to support them.

50   Due to the nature and context of different schools, how digital leads plan the training differs greatly between schools and between phases. Possible approaches include how:

- one special school has mapped the DCF over the school year for each teacher /

class and prepared training specifically for them on the skills they need – ensuring relevant and purposeful training
- the majority of secondary digital leads have formed a working group of teachers to trial out ideas and cascade these to other members in their department / Areas of Learning and Experience (AoLE) group
- one school has formed 'triads' across the school where groups of three teachers support each other; this works well in building teacher confidence and in sustaining support over time

Curriculum mapping

51   All digital leads in the schools visited have started working with staff to map out the DCF into the areas of the current curriculum. This mapping is especially successful in secondary schools as it is often where departments start to discuss how to embed the DCF and understand the importance of each teacher's contribution to the successful realisation of the DCF. Most teachers map sections of the DCF that they feel most relevant for them. While this mapping is developing well across key stage 3 in many cases, only a very few schools have considered doing this across key stage 4, because they prioritise examination preparation.

Preparing support materials

52   Most digital leads produce useful support materials, including aide-memoirs, to help colleagues and pupils develop their digital skills. These can be in the form of electronic information sheets listing useful apps or websites, informative videos showing how to use various apps or software, or ideas on how to introduce the DCF into the classroom.

53   Many digital leads have started to introduce 'rich tasks', which incorporate digital skills as well as literacy, numeracy, thinking skills and problem-solving skills. These tasks enthuse pupils and challenge them. Some rich tasks introduce new elements of the DCF, for example collaborating via Skype in rural schools or introducing coding.

Readiness for realising the DCF

54   As a result of the activity of digital leads and the vision of leaders, nearly all schools visited have already started to realise the DCF. The way in which digital leads have begun to realise the DCF varies, and no one way appears better than another.

55   In over a half of schools visited, all teachers started to realise the DCF at the same time. However, a minority of schools adopted a phased introduction, allowing the more confident staff to start first and try things out and for others to observe and follow their example later. This approach may appeal to schools who have a group of teachers who are less confident. A very few schools plan to embed one strand at a time in order to focus the training and build expertise one step at a time.

56   Over half the schools visited believe that they are ready to realise the DCF fully. By autumn 2018, most of the schools visited will be realising the DCF. This represents a considerable amount of work by all involved. This state of readiness also reflects that nearly 40% of the schools had identified a digital lead by autumn 2015. By autumn 2016, this had risen to nearly 80% of the schools visited.

Teachers' understanding and opportunities for professional learning

57   Many staff benefit from having leaders who share their vision regarding developing the DCF clearly with them. These staff appreciate and understand that the senior management team are fully behind the successful realisation of the DCF, and will be monitoring its development in a supportive manner. In the schools visited, many teachers believe that the leaders have shared their vision regarding the DCF well. As a result of understanding the vision shared by leaders, most teachers are aware that preparing for the DCF is a priority in the school improvement plan and what that involves for the school.

58   In around half the schools visited, all of the staff have been involved in discussing and agreeing the digital plan for the school. Through this involvement, many staff are aware of the plan's content, what it involves and its expectations of them. As a result, most teachers in these schools have positive attitudes towards the preparation for realising the DCF and feel involved. They appreciate how the DCF covers the development of digital skills throughout compulsory schooling and that these skills are to be used in purposeful contexts across the curriculum. They believe that prioritising these digital skills prepares pupils well to deal with the benefits and hazards of technology and to keep themselves safe online, to recognise cyber bullying and to avoid identity theft. These teachers believe that the DCF is a mechanism for providing consistency in pupil experiences across Wales.

59   Most teachers in special schools believe that the DCF caters for learners with additional needs well. They appreciate that the DCF is broken down into small steps so that learners can progress through them at their own pace.

60   Generally, teachers feel more confident with the content of 'citizenship', 'interacting and collaborating' and 'producing' than with 'data and computational thinking'. This reflects many teachers' understanding of the ICT curriculum. However, discussions with digital leads in school and the consortia digital leads highlight that teachers generally do not fully appreciate the breadth of the content within the citizenship strand.

61   Generally, practitioners in the foundation phase feel competent enough in most aspects of the DCF to support pupils appropriately. Practitioners generally feel less competent in delivering the full range of digital skills in key stage 2 and above.

62   Most teachers in special, primary, secondary and all-age schools have started to discuss how to adapt long, mid and short term plans to incorporate the DCF. A few schools have started to embed elements of the DCF and reviewed their practice accordingly.

63   Progress in the majority of secondary schools visited in adapting planning for the DCF across the subject is developing well in key stage 3. Many secondary schools have created working groups of teachers from across departments to trial approaches out before sharing them with others in the department.

Challenges for schools in preparing for the DCF

Vision

64   A few leaders in the schools visited do not have a clear enough vision on how to prepare to realise the DCF. As a result, they have not been able to share the vision well enough with their staff. Staff therefore do not know whether the senior leadership team are fully behind the successful realisation of the DCF, or how they will be monitoring its development. In a few schools the digital lead has not been involved in creating the whole-school vision for embedding the DCF. As a result, they do not have a sense of ownership of the vision and in a very few instances are working in isolation without sufficient support.

65   Around half the leaders of schools that have connectivity issues have not addressed the problem or ensured that the quality of the internet connection and the school's network infrastructure does not hinder their digital work. They have not ensured that the level of filtering and blocking of internet sites by local authorities does not hinder the teaching or learning. In addition, a few leaders do not have enough understanding of the technical issues that have a major impact on the school's capacity to realise the DCF fully.

66   A few leaders do not understand the benefit of joint working between schools, learning from the expertise of the digital pioneer schools and the regional consortia. These leaders do not do enough to encourage staff to collaborate with others, share practice or visit good schools.

Planning

67   A few leaders have not produced a digital plan that prioritises developments for their school or have not included preparing for the DCF as a priority in the school's improvement plan. As a result, leaders in these schools cannot evaluate the effectiveness of their strategy or their digital plans or hold staff responsible for developments. A lack of strategy or of purposeful plan also inhibits the effectiveness of governors to evaluate the provision and measure progress.

68   A few leaders prepared their vision and plan for realising the DCF without involving the digital lead or the rest of the staff in the process. Without this broader involvement, leaders do not create a whole-school approach that staff can understand and buy into. As a result, in these instances staff have negative attitudes towards the preparation for the DCF.

69   Where plans are not good enough, the following shortcomings are often evident:

- arrangements for how and when they will audit whether the network infrastructure is sufficient to meet the needs of delivering the DCF are not identified
- timeframes are vague and do not specify checkpoints to review whether milestones/achievements have been met
- arrangements for monitoring and evaluation are unclear

- staff training needs have not been identified
- training arrangements or plans are too vague
- arrangements for how and when they will audit the software and hardware needs are too vague

70   Generally, while secondary schools are planning for the introduction of the DCF into key stage 3 well, only a very few have started to address how they will do so in key stage 4. Most digital leaders believe that one obvious solution would be to review the current Digital Literacy element of the Welsh Baccalaureate Qualification.

71   Too few leaders evaluate the effectiveness of their digital plans with enough rigour to hold staff responsible for developments. Where evaluation is not effective, leaders do not arrange systematic lesson observations, scrutiny of pupils' work, talking with pupils to gain their views, or checking of teaching plans. As a result, they do not have a clear enough understanding of the strengths and weaknesses of provision or of standards.

Digital leads

72   Although all leaders in the schools visited have appointed a digital lead, not all digital leads have job descriptions or ones that are clear enough. As a result, expectations of individuals are not specific enough for digital leads to be held to account or to be supported. A few leaders did not appoint digital leads soon enough. In a very few instances, it was the autumn term 2017 before this step was taken, a year after the DCF was made available. Leaders in these schools have lost valuable time where digital leads and teachers could familiarise themselves with the framework. As a result, these digital leads' understanding of the DCF is not as developed as for those who started much sooner. In very few cases, leaders do not support digital leads well enough. Where the digital lead is not a member of the leadership team, they sometimes feel that they do not have the authority to address difficult issues, such as equipment issues or concerns about the quality of provision.

73   In a minority of schools, the digital lead has not audited the training needs of all teachers. As a result, many of these digital leads are unaware of the training needs of these staff members. This is an important weakness as a lack of training to build teacher confidence and competence can hamper the successful realisation of the DCF significantly. A few digital leads used an audit tool provided by an external consultant. However, these audits were not always entirely based on the DCF. As a result, while these were generally appropriate, they were of limited use in relation to the DCF.

74   In a very few schools the digital lead has not audited whether there is enough hardware, or whether the school network infrastructure is sufficiently robust to deliver the DCF. This too is an important weakness as deficiencies in hardware or network infrastructure can hamper the successful realisation of the DCF.

75   While, nearly all digital leads in schools visited have started to realise the DCF across the school, this is not the case in all schools. In these schools, the digital lead has not made best use of the time schools have had to prepare to realise the DCF. The readiness of such schools for the DCF is adequate at best. A few digital leads are not proactive enough and have not yet involved teachers in discussing how to

plan activities and lessons. A very few digital leads in secondary schools have not ensured that heads of departments co-operate to ensure that pupils have challenging opportunities to use their digital skills across subjects. They have not started to monitor colleagues' work to ensure that these opportunities are offered.

76 In the majority of schools that have mapped the DCF across the curriculum, digital leads have not yet decided how to address the issue of gaps in provision. This is an issue that schools need to resolve to ensure that pupils experience the breadth and richness of skills in the DCF. Unless schools address this gap in provision, they could be at risk of replicating current issues of poor provision in ICT across the curriculum as key elements are often left out. Too few digital leads have started to map the provision of the DCF across key stage 4 in particular. As a result, most secondary schools are not preparing well to realise the DCF in its entirety.

77 In a few schools, digital leads have not started to prepare for the DCF well enough. They do not offer opportunities for pupils and staff in computer programming and coding. Pupils are not trained as digital leaders to teach and support their fellow pupils and, in some instances, staff. A few digital leads do not value the opportunities to visit digital pioneer schools, or consortia training events. As a result, they do not have opportunities to see emerging good practice, to evaluate what they learnt, or to network. A minority of digital leads create an ethos of dependency on their expertise among staff. As a result, they end up troubleshooting, fixing digital issues and problems in classrooms, rather than enabling teachers to develop these skills themselves.

Teachers' understanding and opportunities for professional learning

78 In a very few schools, teachers do not understand that offering rich opportunities for pupils to use digital skills has a positive impact on teaching and learning, by motivating and engaging pupils. These teachers and support staff do not make good use of digital skills to engage and enthuse pupils. Teachers in these schools are generally less confident in delivering the full range of digital skills in key stage 2 and above.

79 A very few special and primary schools have not started to discuss how to adapt long, mid and short term plans to incorporate the DCF. These schools have not started to implement elements of the DCF or reviewed their practice accordingly.

80 Teachers in the minority of special and primary schools are have not started to offer pupils enough well-planned opportunities to practise their digital skills in meaningful contexts across the curriculum.

81 Centres of initial teacher education and training are beginning to equip trainee teachers with the skills that they need to deliver the breadth and range of digital skills required by the DCF. However, the development of students' skills is too variable due to their limited involvement in DCF developments, and to their lack of awareness of the weaknesses in ICT provision in schools.

82 A few teachers do not feel involved in the process of preparing for the DCF and have negative attitudes towards the preparation for realising the DCF. These teachers believe that insufficient time is given to staff to implement new initiatives and that too many initiatives are brought in.

Common characteristics of successful realisation of the DCF

Leaders

- Define clearly the **vision and strategic direction** for the school; this vision evolves as the school reviews its progress in realising the DCF
- Establish **professional values and behaviours** among staff to support continuous improvement and effective team work
- Establish and maintain a culture where **improving standards and wellbeing** for all pupils is the main priority
- Make **improving the provision for and the teaching of digital skills** a key process that contributes to improving standards in digital skills
- Deliver a **digital competence framework** / **curriculum** that fully **meets the needs of all pupils**
- Sustain a consistent focus on improving pupils' **digital** skills, including higher-order thinking, problem solving and reasoning skills
- Make sure that **professional learning** opportunities for staff improve the quality of provision and standards of digital skills for pupils
- Make all staff, especially those in management roles, **accountable** for successful realisation of the DCF
- Make sure that **self-evaluation** outcomes derive from **first-hand evidence** and are **linked closely to school improvement priorities**
- Provide **governors** with clear, understandable and honest analyses of how well the school is performing and encourage them to challenge underperformance

	Starting the journey	Making progress	Building momentum	Sustaining progress
Strategic vision	Establish a vision for realising the DCF	All staff and the school community understand the school's vision and aims. Leaders review the vision and strategic direction to ensure that it supports further improvement.	All staff and the school community develop the school's vision for continuous improvement and know their roles in achieving the vision. They review the vision and strategic direction to ensure that it supports further improvement.	The school continues with the vision and strategic direction to ensure that it sustains high standards and supports further improvement.

	Starting the journey	Making progress	Building momentum	Sustaining progress
Developing the role of the digital lead and other leaders within the school	Establish a clear management structure to support the DCF.

Appoint a digital lead who has the full support of the senior management team. | Develop the role of the digital lead and ensure that audits of hardware, network infrastructure and teacher skills are carried out. Ensure that the information from these audits inform planning for improvements and the training for staff.

Distribute leadership opportunities and ensure that staff in these roles understand specifically what they are accountable for and have the skills to fulfil these duties. | The role of the digital lead, and distributed leadership, is well established and consistently successful in raising standards in the provision for and the teaching of digital skills. As a result, the school is ready to realise the DCF.

All leaders clearly understand their responsibilities in relation to the provision of opportunities to develop digital skills and pupils' digital standards. | The role of the digital lead and distributed leadership is well established and highly successful in raising standards in the provision for and the teaching of digital skills.

Leaders often help to improve systems beyond their own schools. |
| **Improving teaching of digital skills** | Set up systems to analyse self-evaluation information regarding the realisation of the DCF.

Ensure that all staff understand what good teaching of digital skills looks like. | Embed systems to analyse self-evaluation information about the realisation of the DCF. Involve staff in this process.

Ensure that all staff apply the good teaching of digital skills in lessons. | Systems to analyse self-evaluation information about the realisation of the DCF are effective. All staff in leadership positions are involved and make valuable contributions to this work.

All teachers have a secure understanding of what constitutes good or excellent teaching of digital skills and most lessons are good or better. | Arrangements to analyse self-evaluation information about the realisation of the DCF are consistently effective and reliable. Aspects of this work fully devolved.

The quality of teaching digital skills is consistently good and often excellent. As a result, nearly all pupils make particularly good progress and achieve very high standards. |
| **Developing a digital curriculum to meet the needs of all pupils** | Ensure that the curriculum and provision for digital skills meet the requirements of the DCF.

Improve pupils' digital skills. | Ensure that the digital curriculum meets the requirements of the DCF and matches the needs and interests of all pupils, enabling them to make sound progress.

Sustain the focus on improving pupils' digital and independent learning skills. | Ensure that the curriculum and provision for digital skills support high levels of engagement in learning and help all pupils to make good progress.

All staff have a strong understanding of how to develop pupils' digital and independent learning skills to a high level. | Ensure that the curriculum and provision for digital skills are highly engaging and support all pupils to make consistent high progress. Aspects of this provision may be worthy of replication in other schools and the school shares its good practice effectively.

All staff are highly successful in developing pupils' literacy, numeracy, ICT and independent learning skills. |

	Starting the journey	Making progress	Building momentum	Sustaining progress
Professional learning	Following an audit of staff's skills, establish professional learning arrangements to: • provide specific support for staff, including relevant and interesting digital skills in their teaching • provide specific support to enable staff to support the school to reach improvement goals • use CPD to establish and maintain high expectations in relation to the provision of digital skills for pupils Begin to develop opportunities for staff to contribute to working groups to focus on the realisation of the DCF.	Continue to broaden development opportunities for staff to engage in professional learning to improve their own practice and raise standards for pupils. Working groups begin to contribute successfully to the realisation of the DCF and its planning across the curriculum. They begin to engage with external partners to develop good practice.	CPD arrangements are effective in improving the quality of digital provision. They support improved provision for pupils consistently. Many staff engage in enquiry and reflection to improve teaching and learning of digital skills with good practice shared across the school. Teachers regularly network with colleagues in other schools to raise standards of teaching, learning and wellbeing through the DCF.	Arrangements for the CPD of all staff are highly effective and support a culture of continuous improvement of digital skills at the school. All staff engage regularly in effective professional learning individually or as part of a working group. They engage in research, coaching or mentoring activity to improve their own and others' professional practice in the use of the DCF.
Utilising pupils' digital skills	Establish arrangements to take account of and consider using the digital skills of pupils to train their peers and staff.	Further develop arrangements and training to use the digital skills of pupils to train their peers and staff.	The use of the digital skills of pupils to train their peers and staff is influential and an established part of realising the DCF.	The use of the digital skills of pupils to train their peers and staff has a regular and positive impact on raising standards of provision, learning and wellbeing.

Questions for schools to consider as part of their DCF self-evaluation

As a starting point for planning for the DCF, schools can use the following questions as part of their self-evaluation:

Leadership

1. Do we have a clear vision, created and agreed by all staff, for the way we plan for the DCF? Have we shared this vision and ensured the governing body understand the importance of realising the DCF?

2. Have we translated this vision into a comprehensive and practical plan to drive the initiative forward, and provide a clear rationale for auditing, training, resourcing, monitoring and evaluating?

3. Have we appointed a digital lead and do all staff understand that the lead has the full support of the leadership team? How will we monitor the progress in realising the DCF across the school?

Digital lead

4. How will I carry out a hardware and network infrastructure audit to ensure they are sufficiently robust to deliver the DCF?

5. How will I audit teachers' skills thoroughly enough to evaluate their readiness to realise the DCF and use the information to plan training over a realistic timeframe? How will I ensure that all staff are trained and supported to realise the DCF?

6. How will I monitor that all staff are engaged in preparing to develop pupils' digital competence skills and realise the DCF?

7. How will I bring teachers together to map the DCF across the curriculum, monitor the development and address the issue of gaps in provision

Professional learning

8. Are teachers encouraged to be innovative in their planning? For example:

   - do teachers relate pupils learning to their local / Welsh context whenever possible?
   - are the topics taught and the rich tasks used relevant to pupils and current?
   - is teaching responsive and flexible?
   - do teachers respond to local, national or global issues, for example cyber-attacks or sexting?
   - do pupils have opportunities to develop their work or ideas for a real-life context, developing the value of their work?

- do teachers use technology creatively to support learning and broaden pupils' understanding by widening their experiences to include an international dimension where relevant?

9   How will we ensure that we as teachers have high expectations of all pupils, including the more able?

10 Do pupils lead their learning? How will we gain an understanding of what pupils enjoy or dislike about implementing their digital competence skills in lessons? How will we ensure that pupils will be involved in what and how they learn using their digital competence skills?

Evidence base

The findings and recommendations in this report draw on visits to 23 schools, discussions with the digital lead in each of the four consortia, and an online questionnaire completed by teachers in the schools visited. The schools selected for visits were identified, through inspection and discussion with digital leads of the consortia, as having made good progress in their realisation of the DCF. Of the 23 schools, seven were Digital Pioneer schools that had been involved in the creation of the DCF.

When visiting these schools, inspectors:

- held discussions with members of the leadership team
- discussed with the digital lead how the realisation of the DCF had been planned and delivered
- met with groups of pupils with their work
- met with teachers to discuss how well the DCF had been implemented in their school and encouraged them to complete an online questionnaire
- reviewed curriculum mapping and planning documents along the school improvement plan or digital plan

List of the schools visited

Bassaleg School, Newport
Blackwood Comprehensive School, Caerphilly
Bodringallt Primary School, Rhondda Cynon Taf
Cornist Park School, Flint
Malpas Court Primary School
Portfield School, Pembrokeshire
Presteigne Primary School, Powys
Radyr Comprehensive School, Cardiff
Sofrydd Primary School, Blaenau Gwent
St Nicholas Church in Wales Primary School, Vale of Glamorgan
Whitestone Primary School, Swansea
Ynysowen Community Primary School, Rhondda Cynon Taf
Ysgol Gynradd Bethel, Gwynedd
Ysgol Bro Pedr, Ceredigion
Ysgol Bryn Elian, Conwy
Ysgol Comins Coch, Ceredigion
Ysgol Dolafon, Powys
Ysgol Gymraeg y Fenni, Monmouthshire
Ysgol Hafod Lon, Gwynedd
Ysgol Penmaes, Powys
Ysgol Pennant, Powys
Ysgol Gyfun Rhydywaun, Rhondda Cynon Taf
Ysgol Syr Hugh Owen, Gwynedd

Case studies of how schools are preparing for the DCF

These case studies include contributions from special, primary, secondary and all age schools across Wales that represent the range of:

- size
- levels of social deprivation
- language medium
- location, for example rural or urban

The case studies are shared so that other schools can use them as a catalyst for realising the DCF in their own schools.

We make no reference to commercial packages unless they are available as part of Hwb, the Welsh Government's all-Wales learning platform.

Case study	Sector
1 Our digital journey as a special needs school	Special
2 Our digital journey as a small rural primary school	Primary
3 Our digital journey as a primary school	Primary
4 Our digital journey as a secondary school	Secondary
5 Creating a whole-school vision	Secondary
6 The importance of audits as a starting point for our digital journey	Secondary
7 Overcoming network infrastructure issues in a primary school	Primary
8 Overcoming network infrastructure issues in a secondary school	Secondary
9 Overcoming hardware issues in a secondary school – Bring Your Own Device (BOYD)	Secondary
10 The role of the digital lead in a primary school	Primary
11 The role of a digital lead in an all-age school	All age school
12 Establishing learning triads as part of professional learning strategy	All age school
13 Developing a cross-departmental DCF work plan	Secondary
14 Planning lessons across departments to incorporate the DCF in a secondary school	Secondary
15 Developing the 'citizenship' strand of the DCF by using pupil voice	Primary
16 Developing computational thinking with primary pupils	Primary
17 Developing computational thinking in a secondary school	Secondary
18 Developing the digital skills of pupils with additional learning needs through cross curricular work	Complex needs learning resource base

Case study 1: Portfield School – Our digital journey as a special needs school

Portfield is a special school in the town of Haverfordwest. The 154 pupils, aged between 3 and 19 years, travel in daily from across the county. Around 33% of pupils are eligible for free school meals. The school is a digital pioneer school.

Portfield School led a successful cluster bid by 10 special schools to become a digital pioneer school and worked on the first stage of developing the new curriculum. They appointed a member of leadership team as digital competence lead. Leaders set up a special school group to develop the work of the digital competence pioneer group, to share good practice and to ensure that the way the DCF was implemented would reflect the skill development for pupils with additional learning needs.

They conducted a thorough audit of staff skills and confidence, pupils' skills, hardware, software and school systems. From the findings, they developed a three year action plan that details a rationalisation of digital tools and hardware used across the different key phases and school systems.

A professional learning group piloted equipment and identified relevant ones that facilitated cross curricular use and development of pupils' digital skills.

The school appointed a full time digital competence assistant who worked with the digital competence team to develop a training cycle for the identified tools. They developed a 'buddy system', releasing two staff at a time from classes to attend training in school. The training was targeted at their pupils' specific needs, with the clear expectation that staff would cascade skills to colleagues in class.

Staff developed a series of QR coded video 'help guides' with supporting written notes and shared them with all staff via digital files. These covered areas such as making and editing a movie and uploading files to the digital portfolio on Hwb. They also developed 'help cards' for pupils so that staff could use them to differentiate and encourage pupils to use the tools as independently as possible.

The digital competence assistant gave follow-up support to pupils and staff in class, targeting development following training.

The digital competence team developed termly projects to aid teachers to plan and develop digital skills. This secured the progression of skills across key phases and linked to the topics they were working on each term. Evidence of pupils' work is stored in their digital portfolios on Hwb under the six Areas of Learning and Experience (AoLE) headings. The school / leaders used staff workshops and INSET training to discuss how to enhance teaching and learning using digital tools. The training also enabled staff to moderate pupils' work, annotate the digital portfolios, map which elements of the DCF were covered every term, and review coverage and address any issues.

Staff have also trained and supported other schools through regional and national events.

The school established an online safety council consisting of pupils, governors, teaching and support staff and the leadership team. The pupil digital champions, the 'Tech Team', support online safety awareness and practice across the school.

Leaders developed a new website for school, using the Hwb tool. It promotes internet safety advice regularly for pupils, parents, governors and the wider community.

Impact to date

Pupils' digital skills in the second year of a two-year cycle have improved. A number of pupils create digital work, upload, and save to their files on Hwb independently.

Pupils are more confident using the tools on Hwb and are able to use a wider range of editing functions.

Staff support each other to develop the use of a wide range of applications and software effectively following training. The 'help guides' produced by staff include 'how to' videos and step by step notes and these are used extensively to increase staff confidence.

Staff confidence and skills have improved as evidenced in a second audit.

Collaboration between special schools has been excellent and sharing of good practice enables all to develop further. The initial group of 10 schools has now been extended to about 25, and the school is developing video case studies to share approaches to cross-curricular digital competence teaching and learning.

The use of QR codes for videos on correct use of equipment for positional care, wheel chairs, standers and walkers has ensured that pupils are more comfortable and more able to engage with learning. Staff confidence in supporting the children with this equipment has grown and parents and respite carers have found them very useful outside of the school environment.

Next steps

- Further develop termly projects with training and follow up in class support to extend independence in use of digital tools
- Further develop digital life skills – use of self-scan in shops, online ordering, using skype
- Use video case studies within school to extend range of approaches to teaching and learning
- Continue to share practice with other special schools and develop a bank of resources for all to share

Case study 2: Ysgol Pennant – Our digital journey as a small rural primary school

Ysgol Pennant is a rural Welsh medium school in the village of Penybontfawr in the north of Powys. There are 70 pupils on roll and the school serves the village and the surrounding rural area. There are three mixed-age classes and around a third of pupils are fluent in Welsh. A very few pupils are eligible for free school meals. The school is a digital pioneer school.

Using digital technology is an integral part of the school's learning and teaching practices. Because digital skills are an essential part of daily life and are developing continuously, the school strives to give pupils the skills and confidence to use technology effectively, creatively and safely. The school believes that technology has the ability to transform learning and teaching, and is a key instrument in preparing our pupils to be part of the workplace in the future.

In order for the school to develop the use of digital skills, it had to secure improvements in infrastructure and improve the reliability of the wireless network. The school needed access to educational apps, and consistent and reliable provision of Wi-Fi has been key to developments, although there are still occasions when provision does not allow quick enough access. In order to realise this vision and provide rich experiences for pupils, the school has invested considerably in relevant resources and has taken advantage of free resources. 'Hwb' tools in particular have supported the school's work greatly. This key Welsh Government resource has enabled pupils to develop their digital competence skills and use them across the curriculum.

The involvement of the governing body in enabling the vision was key. Governors strive to improve all pupils' educational performance continuously and support the increasing use of digital tools as a classroom resource and management tool. All members of the governing body have received a Hwb username and log in to their own group in Office 365 on Hwb to access documents that are stored there. All agendas and minutes of the governing body's meetings are kept in the group's files, in addition to documents such as policies, the school development plan and monitoring reports. Office 365 enables governors to access documents from anywhere and allows users to share their work effectively. Another advantage of using Hwb's Office 365 is that governors work in the same way as the pupils. The school development plan identifies the governors' use of Hwb's Office 365 in governing body's meetings as an action. One member of the governing body has particular responsibility for online safety, ICT and the DCF, and visits the school regularly as part of this role.

The use of 'Teams' in Hwb's Office 365 has been useful for staff, pupils and governors. Several teams have been established in Hwb's Office 365, and one of these is the online safety group. This is a group that includes staff,

pupils and two members of the governing body. Within this team are all of the documents and work relating to online safety, including films and presentations. Tabs draw attention to a relevant website or particular document. Agendas and minutes of meetings are stored in the group's OneNote. This facilitates the group's work and saves time, as everything is in one place. It is easy for all members of the team to see and contribute to the group's work. This is true for the governors who are members of the group, and their contribution shows their commitment to the school's continuous development.

As a small rural school, staff are aware of the potential that Skype offers as a free educational tool for teachers to open their classroom to a world beyond the school's grounds. Skype enables pupils to learn from other pupils and contact specialists, and to broaden their knowledge in interesting ways. One successful example is when the foundation phase digital leader shared information with another school about coding with an interactive toy. Three pupils explained how it was possible to code a toy to reach a particular target. This was followed by a question and answer session. Because the other school was not far away, the school lent the toy to the class so that they could trial it. This was a great opportunity to begin to co-operate with others and for pupils to develop their coding skills.

In order to realise the DCF and give priority to digital learning, the digital lead planned a timetable of activities. The staff agreed the long-term plan for the DCF along with recommendations for a different focus each half-term. Initially, there was an emphasis on developing the 'citizenship' strand, because the school believes strongly that all individuals must use technology in an appropriate and responsible way.

Staff used the DCF's mapping tool purposefully to plan to develop pupils' digital competence across the curriculum effectively. They adapted the mapping tool by planning for the six areas of learning and experience in key stage 2, rather than the current curriculum's subjects. This helps with considering the new curriculum and suits thematic planning. The weekly planning tool developed by the consortium is integral to how the school plans. Teachers plan lessons online by identifying the elements of the DCF and the Literacy and Numeracy Framework. The planning tool provides an overview of skills planning for each class and the whole school, and supports purposeful planning and tracking. The headteacher can then monitor the coverage of provision easily.

Providing staff training has been an important aspect of developing digital competence. The training has shaped the learning environment, in which digital devices and resources are used effectively. The school has found that developing pupils as digital leaders and trainers so that they can help and support pupils and staff has been an important aspect of its digital journey. Examples of the roles carried out by the school's digital leaders include creating video clips to explain various tasks, demonstrating tools within Hwb or explaining how a particular app works. Under the guidance of a member of staff, these pupils have been a part of training sessions, where

they have demonstrated various activities to members of staff, visitors, parents and members of the community. Digital leaders have gained confidence in relation to digital technologies, but have also developed good communication and presentation skills.

The digital leader among the staff has created various help sheets; for example, one sheet identifies apps that are used in the school and includes links to video clips that explain further to staff how apps work and their best possible use. This is a successful way of raising awareness of digital resources to develop digital competence skills. The role of the school's digital leader is important in providing training and creating purposeful resources. This promotes staff's understanding and ignites their enthusiasm towards digital learning. Pupils and staff use Hwb tools to co-operate, plan, create, share and evaluate their work, using any appropriate device.

One aspect of Hwb that has been extremely useful to staff is the use of OneNote. A group was set up in Hwb's Office 365 for the school's staff. This online space allows a team of people to send each other emails, take part in conversations, co-operate, and share documents in a common library. Staff can also access the OneNote central calendar and notebook and make extensive use of the OneNote notebook. They make notes, record ideas and information here, write with digital ink, and include pictures, video clips, quotes and documents. OneNote works and synchronises across the staff's devices so that they can open the notebook from anywhere. OneNote includes sections that save the school's plans and monitoring reports. One example of the use of OneNote is when a member of staff is on a course. Members of staff who attend a course are able to write notes straight onto a page on OneNote, where it is available to all members of the school's staff. Documents from the course can be added to the same page, in addition to a picture or video clip.

Staff meetings are now paperless. Agendas, minutes and actions are all accessible on Hwb. This ensures that information is shared easily and that all members of staff have access to all documents and the latest information. This has also reduced the senior management team's workload. This tool within Hwb supports the school's work successfully, including its delivery of the DCF. It also enables pupils and staff to develop their digital competence skills effectively.

Impact to date

- All members of staff and members of the governing body share very high expectations and a vision that is based on providing education of the highest quality.
- The school provides valuable training support to the school's staff and the staff of other schools in the authority and beyond, which leads to raising standards within the school and other schools; the training also develops the staff's confidence to incorporate the DCF in their day-to-day work in school.
- The confidence of pupils and staff in digital aspects has increased

greatly during recent years. The school has embedded the DCF in its day-to-day work. Governors have a clear understanding of the school's digital developments and incorporate digital practices in their work. Staff track digital developments effectively, which ensures that all aspects of the framework are developed.

- The digital aspects have increased pupils' independence and ignited enthusiasm and excitement as they undertake their various digital tasks, and have been an excellent tool in encouraging the development of pupils' oracy and creative skills. The use of digital technology reduces the obstacles for pupils with additional learning needs (ALN) and provides particularly good opportunities to stretch more able and talented pupils. Pupils also show a great deal of enjoyment, which has a positive effect on their confidence and wellbeing.

- Pupils' confidence and communication skills are developing well through working with other schools by using software that allows them to interact and work together. Pupils are enthusiastic about this use of technology, and activities appeal to boys and girls.

Case study 3: Ysgol Gymraeg y Fenni – Our digital journey as a primary school

Ysgol Gymraeg y Fenni is in the town of Abergavenny in Monmouthshire. The catchment area serves the town and the nearby villages.

There are around 250 pupils between 3 and 11 years old on roll, which include part-time nursery age children. Pupils are taught in 10 classes, which include four mixed-age classes.

Eleven per cent of pupils are eligible for free school meals, and 22% of pupils have additional learning needs. A minority of pupils come from Welsh-speaking homes, and very few are from ethnic minority backgrounds.

Ysgol Gymraeg Y Fenni identified digital competence as a key area for learning three years ago. With dated equipment and unreliable networking, the school was determined to improve its provision in order to raise standards in ICT.

The school identified that it needed some radical rethinking of its approach to computers and the advent of new technology. Leaders began restructuring the medium-term planning in order to make it more thematic and provide opportunities for the development of digital skills. They established a rolling programme of investment to ensure that the underpinning network infrastructure and hardware was fit for purpose. When the Welsh Government announced the creation of the DCF, the school was ready for the challenge of implementing the continuum.

The school has already seen obvious benefits and an improvement in standards as a result of the implementation of the Literacy and Numeracy Framework (LNF) (Welsh Government, 2013). Staff use a variety of applications to support the DCF, providing teaching and support staff with the tools to target digital competence and embed it into the wider curriculum.

The school's strategy was based around two major requirements:

- ensuring that all were doing what was in their power to prepare our pupils for life in the 21st century; not only in the creation of documents and media but with regard to ethical and citizenship issues too
- ensuing a robust system of planning, delivering the framework's content and monitoring the outcomes and development of skills as a result of the DCF's realisation

The first stage included a series of relevant steps.

1. The digital lead consulted staff and ensured that they formed an integral part of the process of developing a planning format for everyday use – this involvement would drive the increase in digital skills and, in turn, standards.

2. Leaders carried out an initial audit of teachers' and support staff's confidence and ability to teach the required skills.

3. The digital lead and other confident practitioners led in-house training sessions for staff who had identified their own strengths and weaknesses:

- where there were common gaps in the skills of staff, leaders organised formal sessions and training during staff meetings
- where skills were lacking and training could not be provided in-house, the school sought specialist support

4. Leaders re-visited this audit a whole term after the realisation of the DCF in order to allow staff to self-evaluate their performance and skills:

- this enabled the digital lead, senior and middle management to monitor progress.
- the digital lead offered informal support sessions for individual staff who needed further lesson ideas for forward planning

5. The digital lead carried out a structured audit of hardware to assess where investment was needed to use the allotted budget to its full potential and avoid 'knee-jerk' reaction purchases.

Finally, regular monitoring of work and planning, alongside discussions with both staff and pupils, ensured that pedagogy was in constant development and there was a strong, consistent approach to the realisation of the DCF.

Impact to date

As a result of the training, support and early realisation of the DCF, staff confidence is measurably stronger. Leaders have ensured coverage of skills relevant to pupils' ages. The differentiation of tasks, based on the continuum within the DCF, is a successful method of challenging every child at their individual level. Pupils' confidence is now far greater and their standards and progress are, in many cases, above that expected for their age.

The school's next steps are to identify more able and talented (MAT) pupils in the area of 'digital competency'. The school is developing assistant leaders, one in each key stage, to work alongside the digital lead. This is in order to share training and good practice across the school and to ensure a sustainable commitment to keeping abreast of new development in hardware, software and pedagogy. The school is now sharing its good practice with other establishments in professional learning communities (PLCs) and the Online Safety Taskforce.

Case study 4: Bassaleg School – Our digital journey as a secondary school

Bassaleg School is a mixed 11-19 school to the north east of Newport. Currently, there are around 1,600 pupils on roll, with over 300 in the sixth form. Around 7% of pupils are eligible for free school meals and 8% of pupils are on the additional learning needs register. The majority of pupils who attend the school come from the city, and a minority come from more rural areas. The school is a digital pioneer school.

Bassaleg school has been on a 'digital learning journey' for the last five years. The headteacher and the wider leadership team, including the head of digital technology, developed a strategy for digital learning. The staff and a selection of pupils also contributed to shaping the strategy and its realisation.

All departments have integrated digital learning into the heart of their lesson planning. As a result, pupils regularly use digital skills such as podcasting, blogging and e-portfolio development across the curriculum. These digital skills have improved their ability to collaborate and evaluate their work more effectively. During this time, the school has designed a comprehensive professional development model, which enables all teaching and non-teaching staff members to receive training on how to make more effective use of digital learning to raise standards.

The school has created the Bassaleg "Digital Toolkit". This toolkit consists of various software that staff use to enhance digital learning. To aid understanding of digital learning amongst staff, parents and governors, pupils produced instructional videos. Over time, the toolkit has been adapted to cover the strands of the DCF.

Leaders have developed a strategy that reviewed previous practice in order to move forward with digital competence skills as outcomes from innovative digital learning. The realisation of the strategy was a phased delivery.

Phase 1 – Investigate, innovate and challenge

The school identified staff digital leaders who undertook extensive work, breaking down the DCF and highlighting the relevant areas within their subjects. They also considered how current practice developed pupils' digital competence skills. Staff carried out initial curriculum mapping and undertook a pilot action research task to examine opportunities for "innovation and challenge" in relation to digital learning and the DCF. During this study, the group of staff digital leaders looked at activities that would move pupils through the DCF, provide challenge and not limit them to the areas suggested for their current year group; these activities covered many strands and elements of the DCF.

Phase 2 – Bassaleg digital professional learning approach

Leaders believe that staff professional learning is paramount for digital learning and digital competence to become effective classroom practice.

The school undertook its own professional learning approach, which has the following purposes:

1 Develop the innovative use of digital technology
2 Increase consistency in relation to provision in all subject areas
3..Improve pupil outcomes in skills development

The professional learning approach is broken into various sections:

1 Professional learning needs audit and curriculum mapping tool

Leaders encourage all staff to carry out the professional learning needs tool (available on HWB) and subject leaders carry out a DCF curriculum mapping exercise. As a result of this exercise, they identify areas for development.

2 Department action plan

Heads of department and staff digital leaders develop a subject-specific digital action plan, with guidance from the whole school digital lead. The action plan addresses the findings from the previous stage. All action plans must follow the following criteria;

- strengths
- areas for development
- actions for the year ahead

3 Specific professional learning provision

Staff develop specific learning provision relating to digital learning and digital competence in line with the school improvement plan and the departmental improvement plan. The use of whole school support structures (explained below) helps to develop bespoke training and development opportunities for staff. As a result of feedback from staff members, digital training is carried out in subject areas rather than in cross-curricular groups. In subject areas, staff focus on how they will cover the DCF and the most appropriate ways in which digital learning can play a part in everyday classroom practice. This learning provision includes departmental workshops, academic papers, live streams and online courses.

4 Working groups to collaborate and share new innovations

Along with subject-specific learning, there are also a number of cross-curricular working groups looking at particular aspects of digital learning. Here staff collaborate and introduce aspects of action research into their work. There is also the opportunity to share innovations and tailor them for classroom practice as staff share their ideas. Examples of this have been teach-meets where staff from several schools have shared ideas on the "communication and collaboration" and "producing" strands.

Opportunities for innovation using the high-level principles of pedagogy

Leaders are convinced that digital learning sits with core pedagogical principles and any digital work carried out in the classroom must focus on improving pupil outcomes. The leadership team uses current academic and work-based research to develop an effective approach to digital learning and its links with whole school teaching and learning. This feeds into the various phases of the school-specific professional learning approach.

Whole-school support structures are in place to help embed digital learning, along with face-to-face coaching. A few others are summarised below:

- Digital toolkit – this is a school-specific "toolkit", which has specific apps, websites, and programs linked to specific strands of the DCF.
- Bassaleg digital learning website – this is a school-specific website that contains information about digital learning, such as academic papers, blogs, exemplification, twitter handles and Hwb tools. All information and teacher guidance is easily available and on every device platform.

There is also a wider issue with trying to embed digital learning throughout the school, including challenges relating to network, device management, policy and wider stakeholder understanding (parents, governors); hence senior leadership involvement is paramount and helps staff to deliver digital learning in the class.

Impact to date

Departmental schemes of learning highlight opportunities for pupils to develop aspects of the DCF and all departmental staff offer rich tasks to pupils in lessons. Teachers take care not to include tasks that are contrived since digital learning and digital competence should always promote the subject. At the end of every academic year, staff add new innovations and DCF opportunities to the mapping and departmental documents.

Pupils' digital work shows how their skills are advancing. During the initial mapping, opportunities for the DCF element "evaluating" of digital work were weak across the school. In order to address this, pupils had to self-assess any digital work.

Pupils' digital work now covers a wide range of formats from podcasts to Vlogs and games to flowchart design. The effective use of technology has become an integral part of subject areas.

Case study 5: Ysgol Gyfun Rhydywaun – Creating a whole-school vision

Ysgol Gyfun Rhydywaun is a designated Welsh language secondary school for pupils aged 11-18. It is in Hirwaun near Aberdare and maintained by Rhondda Cynon Taf local authority. There are around 960 pupils on roll, with almost 180 in the sixth form. Most pupils come from three primary schools located within Rhondda Cynon Taf and from two primary schools located in Merthyr Tydfil local authority, although a very few pupils come from the county borough of Neath Port Talbot.

Around 13% of pupils are eligible for free school meals. Eleven per cent of pupils are on the additional learning needs register, and 26% of pupils speak Welsh at home.

The school is a digital pioneer school.

The school appointed a staff member to lead on the framework, undertake the work of mapping opportunities across the curriculum and lead staff training. However, it became clear that there was a range of other aspects that needed to be considered for the framework to operate effectively. As a result, the school took a step back in order to consider digital learning in a wider sense. As a result of this reflection, the school worked on creating a vision for digital learning that included the following aspects:

- the school's ICT infrastructure
- curriculum
- use of technology in the classroom
- online safety and information management
- staff skills and training
- the DCF
- engagement with stakeholders

ICT infrastructure

The school reviewed the number, age and condition of the school's computers, laptops, tablets, servers, network switches and wireless provision. This gave a clear picture of how prepared the school was to implement the new developments and enabled leaders to consider whether it was possible to expand the use of ICT across the curriculum.

This led to the school's infrastructure development plan and a resource refurbishment programme that form part of the school's funding plans.

Curriculum

In line with the DCF's requirements, the school looked carefully at the key stage 3 ICT curriculum and the use of ICT across the curriculum. Leaders decided to adapt and modernise the current curriculum so that it aligned with other curricular developments taking place at the school.

The use of technology in the classroom

The use of technology in the classroom was inconsistent and depended on investment by individual departments and staff confidence levels in using technology.

Undertaking a detailed self-evaluation of the above aspects, together with planning for the realisation of the DCF, has proved very useful and has avoided a number of problems involved in implementing the framework itself. As a result, departments have started planning more strategically for using technology in the classroom, and contributing to an ICT plan across the curriculum. However, a limited budget impedes the developments to a certain degree.

Online safety and information management

The school used the '360 safe Cymru' tool to carry out an online safety audit. The school established an online safety committee for staff with the aim of developing this to include pupils and governors. The digital lead has produced a series of rough guides on information management for staff, and an information security policy, which all staff sign at the beginning of each academic year.

Staff skills and training

The school audited staff understanding and confidence in all aspects of the DCF. The digital lead compiled a series of training sessions in response to staff needs and senior leaders incorporated them into the school's professional learning programme. This has also led to the headteacher and the digital lead working with departments in training on specific software. The purpose of this was to fulfil cross-curricular projects agreed by departments as part of the framework mapping process.

Impact to date

It has been beneficial that the headteacher and assistant headteacher lead on realising the DCF. As a result, they have had a direct influence on structures, finance, staffing and developments at a whole-school level in order to facilitate the process.

The digital lead is equipped to drive developments forward. The mapping, staff audit and planning for the development of pupils' digital competence have gone smoothly, following the realisation of the vision adopted by all staff.

This has enabled the school to re-create plans in key stage 3 to complement the framework and for departments to work together within the areas of learning and experience outlined in Successful Futures (Donaldson, 2015).

Case study 6: Ysgol Syr Hugh Owen – The importance of audits as a starting point for our digital journey

Ysgol Syr Hugh Owen is a secondary school in the town of Caernarfon, Gwynedd. Currently, it has around 860 pupils on roll, with around 180 in the sixth form. Sixteen per cent of pupils are eligible for free school meals. Sixteen per cent of pupils are on the additional learning needs register. Welsh is the home language of most pupils.

Leaders were aware that they needed to address the severe lack of hardware and software and poor network infrastructure before they could embark on developing the digital skills of teachers and pupils. There were very few digital whiteboards in the school, no computer suites were available to book for any other department apart from IT, and most correspondence was carried out on paper!

Leaders identified the need to carry out a thorough review of the situation, and set up a whole-school development plan consisting of detailed and dated action steps that responded to the immediate and long term needs of the school. Leaders were then keen to review the action steps regularly to ensure consistency of approach across all departments. The aim was to ensure the availability of digital equipment and resources, together with high quality training to underpin the school's improvement journey.

March 2014
- Initial hardware and network infrastructure audits carried out
- The audit confirmed that IT resources and network infrastructure were poor
- The audit report was shared with governors

March 2014
- Update of all staff PCs and installation of more Digital Whiteboards
- Setting up of a Homework Club every lunch time in a computer suite for all pupils, ensuring that all pupils had access to computers.
- Appointment of an E-learning Champion

June 2014
- An electronic tablet for all members of staff, and training on these for the teachers to enable them to teach using them

2014-2015
- Use of electronic tablets for teaching was monitored by leadership team

April 2016
- Appointment of a digital lead

Summer 2016
- Triad of teachers from different departments working together to support each other

September 2016
- Digital Learning was a priority in the school development plan under

improving teaching and learning
- Thirty Netbooks purchased, initially for use by pupils in the Welsh Department
- Two IT rooms and 15 electronic tablets were available to book by all departments

November 2016
- The digital lead and a member of the SMT worked to create an agreed vision
- Audit of teacher skills based on DCF– audit done by creating own audit and in a non-threatening environment, as leaders believed that this was important – supportive manner and not judgemental
- Data of training needs from the audit was analysed

January 2017
- Presentation to all departmental leads introducing DCF

February 2017
- Whole-school DCF INSET
- Prior to the INSET all staff asked to view at least one Welsh Government video on DCF on Hwb, hopefully two videos, maybe three – this aimed to ensure that everyone had viewed at least one video!
- INSET comprised of a general introduction to the DCF in the morning lead by the digital lead at a north Wales pioneer school, then a choice of workshops, which resulted in less resistance to change:
  o The use of Hwb tools to realise the DCF, led by the school's digital lead
  o Practical ways of realising the DCF in the classroom, led by a Microsoft Teacher of the year
  o Developing computational thinking, led by the digital pioneer
- In the afternoon, time was given to act upon the morning's training session

February 2017 onwards
- Voluntary drop in workshops every other week on different apps to aid DCF teaching and learning
- Weekly tips on apps via the school's digital bulletin to all staff
- As the school's digital lead was using the school as a base for providing training for other secondary schools in the consortium, this ensured that any member of staff could also benefit
- One of the most successful courses was the sharing of Discussions and Blogging as a homework and classroom task, with pupils sharing their views about library books and recommending good reads – many departments across the consortium have now adopted the same approach

March 2017
- Purchased 90 Chrome Books between the English, mathematics and science departments, along with a further 15 dedicated for the Welsh

Baccalaureate
- Members in nearly all departments encouraged to trial the use of the DCF in lessons

June 2017
- Whole-school INSET on the DCF – presenting the current situation regarding DCF realisation
  - One key message at the INSET was that staff had been given a year to become informed about the DCF and that now there was an expectation by the leadership team that all teachers had to engage
  - Short-term and long-term plans were introduced and clear guidelines on how to plan digitally enriched tasks were shared and discussed
  - A tight timeframe was shared– by September 2017, all departments to adopt at least five DCF tasks in schemes of work

July 2017
- A worthwhile example of departments working together to develop digitally enriched cross-curricular task based on a Year 7 school excursion to Beddgelert (please see case study 14)

Impact to date

As of September 2017:

- Improved hardware and network infrastructure, which now allows realisation of the DCF
  - There are now three IT rooms (30 PCs each)
  - Refreshed PCs for staff
  - Fifty laptops and a further 15 Netbooks for Welsh Bacc
  - Teachers experimenting with allowing pupils bringing their own devices – smartphones (all years), laptops or electronic tablets (sixth form) when relevant
- All departments have adopted at least five DCF tasks in schemes of work
- The DCF is a priority in the school development plan, regardless that it is not statutory
- Departments working together to develop digitally enriched cross-curricular tasks

Case study 7: Cornist Park Community Primary School – Overcoming network infrastructure issues in a primary school

Cornist Park Community Primary School is in Flint, North Wales. There are over 300 pupils on roll, of which around 15% are eligible for free school meals. Around 17% of pupils are on the additional learning needs register. The school strives to equip pupils with the lifelong skills that they need as modern 21st century citizens. The school is a digital pioneer school.

Four years ago, the staff at Cornist Park felt that they could not offer their pupils the rich digital experiences they deserved or teach them valuable skills they would need as 21st century learners. This was due to the poor network infrastructure with regard to internet connection and Wi-Fi, along with the lack of resources. The headteacher and the digital lead felt that purchasing new technology would not be cost effective as the network infrastructure would not have been able to cope.

The Learning in Digital Wales grant was not available at the time and there was very little external support. As a result, the headteacher and digital lead decided to seek support outside the local authority and organised the installation and upgrade of their own internet infrastructure. In addition, they ensured that they provided secure filtering to keep pupils safe.

The school fully understood that installing their own internet line, and leaving the protection of the local authority, was a bold move. Primarily, they wanted to ensure that safeguarding remained paramount. With this in mind, the school embarked on completing the 360 Degree Safe tool on Hwb. This enabled the school to gather information and inform next steps that would influence policies, procedures and practice. Cornist Park later applied for the Online Safety Mark and passed the assessment. It became the first school in North Wales to achieve the Online Safety Mark.

Impact to date

A new line was installed, which was able to support the new technology purchased by the school fully. The school upgraded the line to fibre as soon as this became available. With the new technology working and staff digital competence growing, the headteacher and Digital Lead could see the positive impact that this was having across the school. Staff had more freedom to deliver an exciting, relevant curriculum. The new filtering system meant that staff could access useful educational tools that had previously been blocked by the local authority, and the Digital Lead could monitor staff and learner usage – something that was and still is not possible on the local authority line. When the Welsh Government released web filtering standards in 2015 (Welsh Government, 2015b), the school used the guidance to ensure that the filtering was meeting Welsh Government expectations and keeping pupils and staff as safe as possible.

Case study 8: Ysgol Bryn Elian – Overcoming network infrastructure issues in a secondary school

Ysgol Bryn Elian is an 11-18 school with around 950 pupils on roll, 160 of whom are in the sixth form. The school is maintained by Conwy local authority and serves the community to the east of Colwyn Bay, comprising Old Colwyn, Llanddulas, Llysfaen and surrounding areas. In addition, a large proportion of pupils travel to the school from outside its immediate catchment area. The majority of pupils come from English-speaking homes. Sixteen per cent of pupils are eligible for free school meals, and 22% of pupils are on the additional learning needs register. The school is a digital pioneer school.

Back in 2010, the school IT infrastructure was in need of investment as a result of a period when technology was not at the forefront of the school's vision and priorities. Fibre optic connection had been installed along with a basic wireless infrastructure, but this was not built upon due to lack of funds available. The main issues centred around a slow network and no space on the network for students to be able to save work.

The software was also dated on the older PCs, as well as the system being bloated with unnecessary software. As there was no set budget for investment in technology, development was piecemeal.

Moving forward it was clear that whatever solution was implemented, it had to be sufficiently proportionate to the current need and as sustainable as possible for future development.

Having put out the contract to tender, the school eventually settled on a managed service with local provider. The solution to be implemented included:

- new servers including virtualisation
- a large number of new machines to kit out the IT rooms
- building staff laptops into the contract
- replacement of hardware on a rolling basis: desktops every three years, staff laptops every four years and servers every five years
- utilisation of existing machines that were able to function to create three extra IT suites, albeit lesser in speed, yet still sufficient for basics once RM bloatware was removed

Additionally, due to the licensing arrangement based upon members of staff rather than devices for such software as Microsoft Windows 7 and Microsoft Office, the school was able to make savings and update software at the same time.

Impact to date

Once implemented, the school was now ahead of where it needed to be, and the investment was for a set number of years and included support to

assist the current IT manager. Having a reliable network, contemporary software and storage space in abundance, the school was now in a position to be able to develop the curriculum to provide the rich learning experiences that were required. The IT department invested in physical computing in the form of credit card-sized computers and slowly embedded problem solving and computational thinking into the curriculum.

From this point, staff had improved confidence in the network and the facilities it offered them in delivering lessons. This wholesale development of IT infrastructure ultimately kick started the school's journey to the point where seven years later it was announced as a Digital Pioneer school for the Welsh Government in the development of the DCF.

The school is now utilising cloud based technology whole school in the form of Office 365. It continues to work as a Digital Pioneer school.

It is impossible to overstate the confidence the staff now have in using the system based upon the reliability of service from the managed service provider and the equipment at the school's disposal. Leaders have continued to invest and grow, with additional kit being placed around the school in the form of laptops for student use.

The school invested further in the development of the wireless network to roll out Bring your own device (BYOD) to the sixth form. This has further enhanced the school's ability to get students on front of a computer, as upper school classes no longer need to take up residence in a dedicated IT room.

Case study 9: Ysgol Bryn Elian – Overcoming hardware issues in a secondary school

For the full contextual details please see case study 8.

With the increasing expectation of students to have internet access in lessons, the pressure is on schools to provide ICT equipment to fulfil this expectation. This is particularly the case with sixth form student numbers increasing.

After much research and discussion leaders took the bold step to introduce Bring your own device (BYOD) for our sixth form students. BYOD can be a double-edged sword for some schools. On the one hand, most students come through the gates armed with an array of tech in their bags that has the potential to enhance their learning if directed well. On the other, teachers are worried whether they can trust students to use their own devices in classrooms. This is mainly due to fear of recording, filming, or any other use deemed inappropriate. The school also took into consideration those with no devices when embarking on such a project.

In addition, there is the technical infrastructure issue. Even after overcoming all obstacles in relation to teacher opinion and appropriate directed use, there is the nagging doubt whether the wireless infrastructure can cope with in increased number of devices vying for connection.

When the school embarked on investigating the viability of BYOD, it had already had the Learning in a digital Wales investment of £20,000 for its network infrastructure, with £7,000 of this dedicated to wireless.

Leaders enlisted the services of a local company to undertake a site survey in order to determine weak spots in wireless coverage across the school. They decided to place an access point in every classroom for maximum effect and reduce dropout when classrooms in close proximity are connected simultaneously. The school was in the fortunate position of having adequate data points in all rooms anyway, and this reduced the need for cabling and its associated costs. Leaders were also able to decide where they would need increased coverage, generally in communal shared areas both inside and outside the classrooms.

An additional investment of £30,000 was needed to facilitate this project, which the school leaders agreed to. Understandably, this is a large sum of money for seemingly something that is not really tangible. However, leaders fully understood both the monetary savings on not having to purchase IT equipment if pupils were allowed to BYOD. Most importantly, they also understood the benefit to students and teachers in effectively flooding the school with Wi-Fi signal.

To ensure the stability of the network and to avoid disrupting learning, BYOD was rolled out to all Year 13 students. Each student had to sign the agreement related to the BYOD acceptable use policy.

Impact to date

In this first phase, 60% of Year 13 signed up with no impact on network speed for the school. Six months later BYOD was rolled out to the whole of the sixth form, with no negative impact on the speed of the network for the remainder of the school.

The planned works leading up to the realisation were done to make sure the network would not suffer as a result of an increase in connections. Now the sixth form is connected with no problems, leaders can begin to introduce BYOD to GCSE classes. Leaders have several devices in school that students can use if needed, ensuring that no one is disenfranchised should they not have their own.

When investigating the feasibility of BYOD in school the key points to consider are:

- current network infrastructure
- ability of network to sustain new devices
- potential cost to build capacity in the network
- how to ensure that those without devices are not disadvantaged by the roll out

Finally, such a system really does enable a school to be truly connected; especially now all staff are working through Microsoft Office 365. With the introduction of Microsoft Teams, and the ability to mark work online with the use of Bluetooth enabled pens, staff and students are working in a digital space in a 21st century Digital Pioneering school.

Case study 10: Presteigne Primary School – The role of the digital lead

Presteigne Primary School is situated in a small market town on the Welsh-English border. The school catchment area serves the town and local villages.

There are around 170 children between 4 and 11 on roll. The children are divided into six classes, four of which are mixed age.

Eleven per cent of pupils are eligible for free school meals and around 20% of pupils have additional learning needs. Six per cent of pupils have English as an additional language. Very few pupils come from Welsh-speaking homes.

Presteigne Primary School identified digital competence as a priority development area two years ago. The school appointed a digital leader to support the school's leadership team in planning for and implementing the new framework.

Through the auditing of current practice, including strengths and weaknesses, leaders were able to identify key areas for development to ensure readiness for the realisation of the framework. One key development area included aspects of the framework for which staff did not feel they had the skill set to deliver.

The school's strategy was based upon the leadership team empowering the digital leader to support and develop teaching and support staff's understanding of the framework and facilitate appropriate support and training to be able to deliver the DCF.

The digital lead carried out an audit that identified strengths and weaknesses within the skills sets of the teaching and support staff. The digital leader used this information to plan for support and training sessions. She also identified the aspects of the framework in which she was less confident. Specialist support from within the consortium was used to equip the digital leader with the necessary understanding, confidence and skills to support all other staff.

The digital leader worked with the leadership team to plan and implement comprehensive in-house support and training packages. Key areas, such as coding and programming, became a focus for staff meetings, during which the digital leader would support staff to develop their confidence, knowledge and understanding of the framework.

Following training, further support included peer observations. Having an established and 'supportive' culture within the school, it was felt that all staff would benefit from observing good practice in other classes. This often, but not always, included the digital leader. This support proved extremely beneficial and enabled colleagues to share their strengths and consider how to develop the practice within their own classrooms. Examples included the use of QR codes, green screening and animation.

The digital leader also trained a number of pupils from all classes (Digital Wizards) in the use of digital hardware and software, including the use of apps. Their knowledge and understanding proved extremely beneficial, as they were able to support pupils not only in their own classes but also in others. Their expertise has also enabled staff to deliver opportunities for DCF with support.

Further staff skills audits were carried out in the following terms, which enabled the school to plan and implement further development opportunities. Evaluations of DCF opportunities across the curriculum have enabled identification of subject areas where staff would like further support and training opportunities.

Impact to date

As a result of strong digital leadership, the school was able to identify and prioritise development needs. The confidence of the staff is much greater, and the creativity in the way the DCF is being implemented is ever-increasing. Staff are able to identify opportunities and plan a range of tasks that develop pupils' digital skills.

Case study 11: Ysgol Bro Pedr – The role of a digital lead in an all-age school

Ysgol Bro Pedr is situated in the town of Lampeter and is maintained by Ceredigion local authority. The school admits children to the primary department at three years of age, and admits pupils from other partner primary schools within the local authority and beyond to the secondary department. There are around 1,040 pupils on roll, including 360 in the primary department and 680 in the secondary department. Ysgol Bro Pedr is an amalgamation of two schools, namely Ysgol Gynradd Ffynnonbedr and Ysgol Gyfun Llanbedr Pont Steffan. 'Canolfan y Bont', which is a county resource for secondary age pupils with profound needs, is situated on the school's grounds.

Fourteen per cent of pupils are eligible for free school meals, and 43% of pupils have additional learning needs. Around 40% of pupils come from Welsh-speaking homes, and more than 8% speak English as an additional language.

The headteacher has a clear vision that is based on the principle that '*Each child counts at Ysgol Bro Pedr*'.

Following a successful inspection in October 2016, where provision for ICT was judged as being excellent in the primary sector, the school re-structured responsibilities. As a result of this, one co-ordinator was established as a digital lead with responsibility for developing digital competence across the 3-19 age range.

Planning and preparing in order to incorporate the requirements of the DCF across the curriculum was one of the priorities in the School Development Plan for 2017-2018.

Under the guidance of the digital lead, the school responded strategically to this challenge by implementing the following actions.

The digital lead gave a comprehensive presentation to the school's staff (teachers, administrators and support staff) as part of an INSET activity on the background and principles of the DCF.

This ensured an awareness of the need to develop and embed 'Digital Competence' across the curriculum, and that it was the responsibility of all of the school's staff.

The next step was to gather information about the 'digital' experiences that pupils currently receive. A simple template was provided to each secondary head of department / primary teacher in order to complete the audit, and 100% of forms were returned.

The responses to the audit were analysed in terms of relevance to the DCF in order to identify aspects for development before starting to map provision across the 3-19 range.

Following discussions with a cross-section of staff, a Digital Competence vision was created for the school. The vision is displayed in the form of a poster in all teaching rooms in the school in order to ensure awareness and to give status to the framework.

The digital lead designed a poster to raise awareness of the content of the strands within the DCF, and a copy was provided for each classroom.

By using 'Forms' in Hwb's Office 365 (accessed through the Hwb website), information was gathered about the staff's ICT skills in order to plan and prepare to deliver and teach lessons in line with the requirements of the new DCF.

Three questionnaires were created in order to gather relevant information about the following:-

1 Computer, Hardware and Environmental Management
2 Word Processing, Spreadsheets and Databases
3 Using the Internet, email and iPad

The responses to the questionnaire were transferred to an Excel spreadsheet to facilitate the process of analysing the results in order to identify the staff's needs in terms of skills training. Ninety six per cent of questionnaires were returned.

A series of training sessions was organised by the digital lead in order to increase confidence and meet needs, in line with the questionnaire results and staff requests. These sessions were provided by the digital lead and members of staff who were willing to share their expertise.

As a result of the increasing demands on staff time, there were difficulties in securing a number of dates to conduct training sessions.

In addition, pupils who were more able and talented in terms of ICT provided training sessions for members of staff on coding skills and creating a film by using iMovie software. There was a very positive reaction to these extremely valuable and beneficial sessions.

A practice that has also proved to be very successful in the primary sector is encouraging pupils in Years 5 and 6 to help the process of transferring skills by supporting pupils in the foundation phase to develop new skills in the ICT suite.

An emphasis is placed on incorporating digital competence skills in learning experiences across the curriculum, and attempting to ensure the use of suitable software to present and develop digital literacy and numeracy skills through original and stimulating activities.

The Professional Learning Triads scheme was used to promote and develop aspects of teaching and learning digital competence (more details below).

In order to ensure that evidence was recorded effectively, a system was created to record the activities that are presented to pupils on the school's network. Folders were created for the school years, in addition to subject sub-folders that include a folder for the four strands that are included in the framework.

An area for cascading information and documentation on the DCF is also available to staff.

The plan is to use the system to record this evidence to track provision by monitoring examples (on the 'Shared Drive') of the experiences and activities that are presented to pupils across the age range, across the curriculum and within subjects in order to identify aspects that need to be developed further.

The work of mapping the requirements and content of the framework for each year in order to ensure development and continuity in skills is ongoing. Provision in terms of the primary sector is developing well and the next step is to ensure provision in terms of transition to key stage 3 and key stage 4.

By working with the personal and social education co-ordinator, the school has ensured that provision includes elements of online safety, which is part of strand 1 of the DCF, Citizenship. A decision was made to target elements of strand 1 – Citizenship – during the autumn term 2017 in order to increase the staff's confidence and understanding.

Ysgol Bro Pedr works closely with the additional primary schools that feed into the school in Year 7 by organising evenings to share good practice in order to present and receive ideas in relation to literacy, numeracy and information technology skills.

Information about the DCF is presented for parents on the school's website, in addition to information and advice about online safety, and the information is updated each term.

Various online safety activities from the framework are conducted to coincide with the Safer Internet Day, focusing on the theme: Creating, Linking and Shared Respect.

In the primary sector, elements of the framework that are delivered in each class each week are recorded by using the consortium's planning/tracking tool. Members of the senior team are able to monitor planning and provision in the primary sector by using by using this online tool.

During the summer term, the school will monitor pupils' progress against the framework's requirements and will report to parents on pupils' attainment in terms of digital competence skills.

Information is cascaded to the governing body about developments in relation to delivering and realising the DCF.

Impact to date

Establishing one digital lead with responsibility for developing digital competence across the 3-19 range ensures continuity and progression in terms of developing skills from one key stage to the next.

Providing internal training, which is tailored to the staff's specific needs, has proved to be useful and successful. Training in a homely environment ensures that software and ICT equipment that are already on the school's network are used in an interesting and exciting way. A positive effect was seen in terms of pupils' participation and interest, in addition to the staff's confidence in presenting various aspects of information technology and the use of equipment, with which they may previously have been unfamiliar.

Case study 12: Ysgol Bro Pedr – Establishing learning triads as part of professional learning strategy

Information about the school

For the full contextual details please see case study 11.

The school is currently a pioneer school and is working with the Welsh Government and other schools to proceed with developments in relation to professional learning. One of the school's functions as part of this is to work on developing the 12 Pedagogical Principles that are identified in Successful Futures (Donaldson, 2015).

The first priority in the school development plan for 2016-2017 was to 'Raise standards of learning and teaching in order to improve pupils' progress and achievement'. This remains a main priority for 2017-2018.

As the school began its work as a pioneer school, it realised that it needed to ensure consistency, share good practice and develop pedagogy

The school committed to the 'Learning Triads' scheme, whereby teachers plan jointly, then teach a lesson and observe each other.

Following one successful cycle with a focus on Teaching Methods, a decision was made to use the Learning Triads scheme to upskill teachers in order to help them to develop the DCF across the school (3-19).

Description of activity/strategy

The scheme is based on three teachers working together over a period of time to plan jointly, experiment, observe each other's teaching, share good practice and develop confidence in their teaching.

In order to increase confidence and awareness of the content of the strands, teachers were given freedom to choose a specific element of the DCF as a focus.

An emphasis is placed on setting clear objectives for pupils, challenging groups of pupils in line with their ability and developing an understanding of each pupil's digital competence.

The Professional Triad Planning Cycle:

Meeting 1: Joint planning 1. The three teachers plan jointly, one of three teaches the lesson and is observed by the other two teachers. A lesson observation sheet is completed.

Meeting 2: Lesson feedback 1. Plan lesson 2 jointly. The second teacher from the triad teaches and is observed by the other two teachers. A lesson observation sheet is completed.

Meeting 3: Lesson feedback 2. Plan lesson 3 jointly. The last teacher from the triad teaches and is observed by the two other teachers. A lesson observation sheet is completed.

Meeting 4: Lesson feedback 3. 'Feedback Form' is completed for the management team.

The triads are organised in various ways:

- Three teachers with the same level of responsibility
- Inexperienced teachers with experienced teachers
- Cross-subject triads
- Triads in different key stages

A number of the triads, in addition to some individuals, have recorded their lessons using digital video equipment. This equipment has enabled teachers to record lessons in the form of a video and to focus on the conversations and discussions of groups of pupils by placing microphones in specific locations in the classroom.

This practice has proved to be very valuable in terms of measuring pupils' knowledge and understanding of the expectations that are set for them, in addition to checking that the level of challenge that is set is suitable for their ability.

Teachers are able to evaluate themselves and their peers, and are able to revisit significant and interesting periods in lessons, which has proved to be very powerful.

A broad cross-section of contexts for lessons were seen, including the following examples:

Strand 1 – Define and identify forms of cyberbullying, how to avoid it and the consequences of such actions
Strand 2 – Discuss the advantages and disadvantages of different way of communicating online and when it is appropriate to use them
Strand 3 – Record and edit sound and video, and create and animation by using a green screen
Strand 4 – Create and interpret a database and use formulae to solve problems and create graphs by using spreadsheets

Impact to date

Using the Learning Triads scheme to focus on elements of the DCF has succeeded in raising teachers' awareness of the content of the requirements, in addition to their confidence in teaching these skills.

By allocating specific time for the scheme, it is an effective way of giving teachers opportunities to observe classroom practice, share ideas, gain confidence and support each other in the context of digital competence.

Teachers see the value of working in triads and feel that they are supported to improve their teaching practice continuously without too much pressure and in a supportive environment.

Leaders have a good understanding of the standard of teaching and learning across the school, and recognise that this has ensured consistency in the quality of teaching.

Case study 13: Ysgol Gyfun Rhydywaun – Developing a cross-departmental DCF work plan

For the full contextual details please see case study 5.

ICT is taught in key stage 3 in discrete lessons for one hour per week. Teachers planned very little ICT work across the curriculum before these developments and none of the work done within subjects aligned with the ICT work within the discrete lessons.

In January 2017, the leaders adapted the staffing structure to create faculties linked to the areas of learning and experience mentioned in Successful Futures (Donaldson 2015). This provided an opportunity to adapt work plans across the subjects to create cross-cutting projects and to adapt ICT plans for key stage 3 in order to achieve the following qualities:

- modernisation of content
- alignment of content with areas of learning and experience
- support for ICT work within subjects

Description of activity/strategy

1   Creating a vision for digital learning
2   Appointing a framework co-ordinator (a member of the leadership team)
3   Undertaking the initial INSET training for staff in order to introduce the framework and explain the various threads and elements
4   Mapping the current use of ICT and its potential for the framework and exploring potential activities for further development through the subjects
5   Arranging meetings between the co-ordinator and each subject leader at an individual level in order to verify and modify the content of the framework
6   Providing INSET training for groups of departments regarding various aspects of the framework
7   Developing a work plan for key stage 3 based on the content of the map and discussions with subject leaders

Following the faculty restructuring, leaders asked faculties to produce a termly cross-cutting project for September 2017 onwards and ideas and further plans agreed during the summer of 2017.

Staff produced a good range of projects and incorporated these into a brand new ICT scheme of work for key stage 3. Most ICT activities now include a focus on developing pupils' subject knowledge and understanding, and align with the cross-cutting projects.

Here are some of the activities, learning areas and an indication of in which school year they are delivered:

- producing a podcast on the miners' strike (coal and the valleys project –

Year 7 humanities)
- programming the BBC Microbit to create a pedometer; capturing and analysing fitness data (health and wellbeing) (Year 7 and Year 8)
- creating a tourism website for Basilicata a Piedemont (Year 8 humanities)
- creating negative and positive social network profiles for Henry VIII (Year 8 humanities)
- developing spreadsheets for teaching/presenting elements of mathematics (Year 8 mathematics and numeracy)
- writing interactive gothic fiction in the form of an adventure game (languages – Year 8)
- creating a computer game with a religious theme (humanities – Year 9)
- creating an app that provides advice on aspects of citizenship in the DCF (languages and arts – Year 9)

Impact to date

Faculties have been running the scheme since September 2017 and the response from the pupils has been very good. Through the new scheme, pupils develop a range of ICT skills, which include a number of multimedia and online skills, developed within subject contexts. This includes creating videos, websites, blogs, vlogs, podcasts, social media profiles and interactive games as well as the development of skills within the traditional desktop applications such as word processing. The context for these activities is provided by the subjects and the inter-departmental projects as part of the emerging 'Donaldson-style curriculum' at the school.

One of the main positive outcomes of the scheme is that departments provide time for developing pupils' ICT skills in contexts relevant to their subjects. This increases the contact time for developing pupils' ICT skills and digital competence and, as a result, the quality of work has improved.

The scheme meets the National Curriculum for ICT and fully meets the requirements of the DCF in key stage 3.

Next steps

- Training sessions for individual departments on specific software/apps in order to equip them for presenting the various elements effectively
- Seeing if it is possible to refine some of the Welsh Baccalaureate challenges so that the key stage 4 DCF elements can be fully mapped to the Baccalaureate
- Evaluate and refine the scheme for the future

Case study 14: Ysgol Syr Hugh Owen – Planning lessons across departments to incorporate the DCF in a secondary school

For the full contextual details please see case study 6.

The school was appointed as a Pioneer School in January 2017.

While the leadership team was preparing strategically to encourage staff from different departments to work together, a small group of teachers came together to experiment with different methods of co-operating. A journey on a steam train was organised for Year 7 as part of the Activity Week at the end of the summer term, and this was the trigger that prompted teachers to think creatively. This was seen to be an excellent opportunity to work across subjects by using the landscape from Caernarfon to Beddgelert as inspiration.

The school's digital leader and head of physics worked together to develop a number of cross-subject tasks that focused on developing pupils' numeracy, literacy and thinking strategies. A workbook was created by using the Office 365 on Hwb to promote digital co-operation. This reduced the need for meetings because everyone could see the tasks and edit them at a time that was convenient to them. The staff involved agreed that the tasks were challenging and interesting enough to be used in lessons before the trip itself.

Pupils were given time to work on the booklet during lessons before the trip. They were then to complete a number of tasks during the trip itself. Teachers would give pupils time after the trip to complete the booklet and to work independently on creating a digital guidebook based on the trip. The aim of the guidebook was to enable pupils to apply all of the information that they received during the trip and the digital skills that they had learned during Year 7, and to convey them to a new audience

The steps they took included:

- agreeing the date of the trip – the first Monday of the Activity Week
- teachers working together to plan and prepare the workbook
- printing the booklet professionally
- presenting the book to pupils during morning assembly to ignite enthusiasm
- carrying out a week of lessons to become familiar with the booklet with subject teachers
- going on the trip from Caernarfon to Beddgelert and back on the steam train
- having a question and answer session with railway workers on the platform, visiting Beddgelert, the grave of Llywelyn's dog, visiting the grave of the poet T.H. Parry-Williams, going on a walk to observe nature and, of course, tasting the village's famous ice-cream!
- arranging that pupils use #YSHOBeddG on social media
- allocating two weeks for pupils to complete the booklet once they had

returned
- working independently to create a Digital Guidebook
- celebrating the best workbooks and best guidebooks in an assembly

Impact to date

- Teachers had a positive experience of cross-subject working
- Teachers benefited from using the Hwb learning platform to work together when planning jointly and were able to share these skills with pupils later on
- The DCF has become a natural part of the planning process rather than an artificial addition
- The school has started on its curriculum journey in a fun and exciting way
- Pupils have benefited more from the trip by having an opportunity to research before going on the train and therefore were able to appreciate the scenery so much more
- Pupils have been given an opportunity to apply their knowledge to create a Digital Guidebook without considering all of the subjects separately

**Case study 15: Cornist Park Community Primary School –
Developing the 'Citizenship' strand of the DCF by using pupil voice**

For the full contextual details please see case study 7.

Cornist Park strongly believes that using digital technology and digital citizenship should go hand in hand. This is why it has strived to educate its school community in an engaging manner and instil values to keep them safe in the ever changing online world. It began its journey by forming a pupil online safety team. The team quickly became responsible for raising awareness of how to stay safe online by educating not just other pupils but the parents, teachers, governors and the wider community.

The online safety team offers support to a variety of groups:

1   Learner support
- Bubble time – every half term the online safety team organises a 'Bubble Time' session, which allows pupils to drop in and discuss any online concerns or problems with their peers. All members of the online safety team are trained to help their peers and record all issues using an online incident form. The data from the incident form keeps the leadership team and teachers up to date with any new social media sites that are causing problems.
- Assemblies – the online safety team hosts half termly assemblies for peers. The theme of the assemblies depends upon what issues have arisen in Bubble time or which social media platform appears to be the most popular.
- Learner led lessons – the online safety team visits each key stage 2 class every half term to deliver a digital citizenship lesson. Members have also visited other schools to help other pupils and teachers.
- Making learning fun – the online safety team members have used their coding skills to create games in Scratch to promote digital citizenship. Along with their peers, they have online safety songs to help children remember how to stay safe: https://youtu.be/md_TM_cUS8M
- Collaboration – the online safety team has worked with the school council to produce a cyberbullying page for the anti-bullying policy (created by pupils for pupils).

2   Staff support
The school begins each academic year with online safety training for all staff, including teachers, support staff, midday supervisors, and kitchen and cleaning staff. Staff then receive regular updates/training through the year. The school has developed the role of an online safety governor. The online safety governor attends regular training sessions and meets with the pupil online safety team every term to discuss issues in the school. He also helps to appoint new members of the online safety team each September.

3   Parental support
Cornist Park identified that its investment in technology would result in

pupils wanting similar devices at home. This made educating both pupils and parents on online safety vital. Parents complete regular surveys about digital technology to assess how it is used at home and what they want to know more about. With the help of the pupils, the school have organised many events such as 'Freaked Out Parents Evening', 'Digifest' and 'Digi Family' workshops. The purpose of these sessions is to educate parents about using digital technology at home, to aid learning and to ensure they keep their children and themselves safe online. At every parents evening, the online safety team and Digital Leaders organise a 'Digi Desk'. This allows parents to drop in and ask online safety questions or discuss technical issues. The online safety team also make videos to help parents for example, to teach parents about PEGI game ratings or songs to promote online safety.

4   Community support

The online safety team has visited the library to put up safe searching posters by the children's computers. On another occasion, members created leaflets filled with advice for safe Christmas online shopping and gave them to community members in the library who were using the public computers. Furthermore, they have held a drop in session at a local bank for customers to learn about how to keep their banking details safe online.

Impact to date

Digital Citizenship is truly at the heart of the curriculum and the school community due to the hard work from the pupil online safety team and the staff at Cornist Park.

Case study 16: Ynysowen Community Primary School – Developing computational thinking with primary pupils

Ynysowen Community Primary School is located in Aberfan and maintained by Merthyr Tydfil local authority. The school provides education for 261 pupils, where 31% of pupils are eligible for free school meals. Around half of pupils have additional learning needs.

Pupils in Year 5 and Year 6 took park in a drone workshop run by a specialist company.

Designed to help schools improve pupils' understanding of 'computational thinking', 'problem solving' and 'modelling skills', the workshop aimed to ensure that pupils begin to be able to:

- demonstrate how programs or processes run by following a sequence of instructions exactly and in order
- demonstrate how an algorithm is useful for representing a solution to a problem through testing
- understand that changing instructions can affect or even terminate a process; for example, moving instructions around in a program could produce unexpected outcomes or cause the program to fail altogether

Pupils worked in small flight teams to plan and calculate solutions to complete real-life indoor drone missions.

They worked out flight paths, and estimated the distances and manoeuvres required to fly a mini-drone from one location to another, overcoming obstacles along the way.

Each group sequenced the solutions, produced a test program and uploaded the flight control program to the mini-drone.

Pupils then evaluated, revised and re-tested their solutions accordingly.

Impact to date

It was a fun and engaging way to bring learning alive and helped to improve pupils' computational thinking. Teacher observations show that pupils were enthusiastic and totally engaged as they tested their code to fly the drone around the obstacle course.

Throughout the project, pupils applied their literacy and numeracy skills and displayed their digital competence. They worked well together in groups, and both self and peer-assessment were an integral part of the activity as pupils revised and re-tested their flights accordingly.

The groups analysed their results at each stage, sharing successes, ideas and solutions to ensure 'whole class' success in providing a collaborative solution to the problems. This ensured a free flow of ideas, and developed effective communication and a commitment to achieving whole class success in delivering a project.

Pupils built resilience, and an appreciation of the value of collaboration and the importance of recording solutions and results in a way that can be replicated and improved by others.

https://drive.google.com/file/d/0B-t2mgq_aM3rM0d1T0sxUmRsWVE/view?usp=sharing

https://drive.google.com/file/d/0B-t2mgq_aM3rNXNQVG5uN1hyeUU/view?usp=sharing

Case study 17: Radyr Comprehensive School – Developing computational thinking in a secondary school

Radyr Comprehensive School is an 11 to 18 mixed comprehensive in the north west of Cardiff, which provides education for around 1,300 pupils. Around 7% of pupils are eligible for free school meals and 11% of pupils have additional learning needs. Many pupils speak English as their first language and come from a white British background.

Even though the results at key stage 3 were good from Sept 2010 to July 2012, the proportion of girls opting for GCSE computing in key stage 4 was extremely low. This low uptake was also evident nationally. In the summer of 2013, out of a key stage 4 cohort of 25 pupils, only two were girls. In order to address this issue, leaders identified the need to review the key stage 3 scheme of work.

Leaders believed that they needed a curriculum with a greater focus on computational thinking and a course that was more relevant, interesting and challenging. This tied in with the ICT review report of the Welsh Government, which was the springboard for the DCF.

To start in 2012, the entire key stage 3 scheme was reworked and revamped to include a greater emphasis on computational thinking. Careful mapping of the National Curriculum ensured that all aspects were covered. New subjects such as 'Text Based Adventure', 'Problem solving with Scratch', 'Querying data with SQL', 'Kodu Games Lab', 'Computing Maths & Binary', 'Text Based Programming', 'Games Authoring', 'Problem Solving & Control Systems', 'Advanced SQL' and 'Boolean Logic & Searching' were all included.

Where possible, lessons give 'real world' examples and students are taught to see the value of computer science through university visits and trips.

These changes were implemented as they allowed a greater focus on computational thinking whilst making the course more relevant and interesting. The changes reflected the main messages of the ICT Steering Group's Report to the Welsh Government (Arthur, Crick & Hayward, 2013) and prepared pupils well for the DCF.

Students are introduced to software developers and project managers who are invited to the school to give an overview of their day-today business. Specifically, the chief executive officer of a large games company comes to Radyr every year and shares his expertise to enthuse the students.

Impact to date

Uptake for computer science at key stage 4 has increased notably whilst numbers opting for ICT remain buoyant.

In 2013, only 25 students in key stage 4 studied computing and of these only two were girls. There are now 158 studying computer science across key stage 4 and of these 73 are girls.

This increase of numbers can be attributed to the change in the planning and delivery of information technology in key stage 3. As a result of these changes, pupils are now more stimulated and challenged by the subject. The facilities remain the same. Apart from one change in 2014, the staff also remain the same.

The A*-C results at GCSE for computer science and ICT from 2014 to 2017 show that, in nearly all instances, 100% of pupils gained A*-C.

Case study 18: Ynysowen Community Primary School - Developing the digital skills of pupils with additional learning needs (ALN) through cross-curricular work

For full contextual details please see case study 16.

Description of activity/strategy

The pupils in the key stage 2 Complex Needs learning resource base used digital skills as a creative tool to explore fairground rides as part of their DT topic.

The pupils completed the following tasks:

1   researched the different types of fairground rides; recorded their findings using MindMap2
https://drive.google.com/file/d/0B8Naga2IvxR4M0g5V1JKeFZPV0U/view?usp=sharing

2   built a carousel using a purposeful construction kit; used an app to record how they made it
https://drive.google.com/file/d/0B8Naga2IvxR4d2xLYkQtNkx6Q0k/view?usp=sharing

3   used a range of games/apps to create a roller coaster

4   utilised the green screen to create a roller coaster ride
https://drive.google.com/file/d/0B8Naga2IvxR4dzlxUHBpX3JlN1k/view?usp=sharing

The importance of copyright was discussed with the pupils, and a royalty free video from you tube was used.

Impact to date

Teacher observations showed that pupils were enthused and engaged throughout the topic. The pupils applied a range of literacy and numeracy skills and displayed their digital competence.

From the DCF itself they covered*:

- Citizenship – Digital rights, licensing and ownership
- Interacting & Collaborating – Storing & Sharing
- Producing – Planning, sourcing & searching, Creating, Evaluating & Improving

*Exact skills vary by pupil as the project was completed by a mixed age class.

Peer assessment was an integral part of the activity, as pupils revised and re-tested their work. The pupils worked well together in groups, and teacher observations demonstrated an improvement in social interaction of pupils with communication difficulties.

During teacher observations of pupils' presentations, it was evident that 77% of the pupils had improved their oracy skills, gaining and using a range of new vocabulary.

Glossary

Areas of Learning and Experience (AoLE)
Successful Futures recommends that the curriculum 3-16 should be organised into six AoLE: Expressive arts; Health and wellbeing; Humanities; Languages, literacy and communication; Mathematics and numeracy; and Science and technology.

BBC microbit
The Micro Bit was designed to encourage pupils to write software for computers.

Binary
Often seen as the simplest form of computer code or programming data. It is represented by a binary system of digits consisting of a string of consecutive zeros and ones.

Bloatware
This is often a term for unnecessary software pre-installed on new computers. The term is also used to describe software that has unnecessary features that use a large amount of memory and slows the computer down.

Blog
Originally from the word "weblog" or a "web log". In its simplest form it is an online journal or diary.

Boolean logic and searching
These types of searches are often used to search a database. Users combine keywords they need to search for with 'operators' such as AND, NOT and OR to generate more relevant results.

Bring your own device (BYOD)
A policy of allowing pupils to bring their own devices (tablets, mobile phones etc) to school, and to use them in accordance to an agreed protocol (usually set out in an Acceptable Use policy)

CPD
Continuous Professional Development is the term used to describe the professional learning activities teachers and leaders participate in to develop and enhance their skills, knowledge and competence.

Digital Competence Framework (DCF)
Digital competence is one of three cross-curricular responsibilities, alongside literacy and numeracy. It focuses on developing digital skills that can be applied to a wide range of subjects and scenarios (Welsh Government, 2018).

Digital Lead
The person identified to lead on the DCF within a school or consortia

Digital Pioneer schools	Schools that have worked with the Welsh Government and other schools to develop and pilot the DCF as part of a new curriculum for Wales
Donaldson-style curriculum	A curriculum adopting the principles of Successful Futures
Forum	An internet forum is a discussion area on a website. Here members can post discussions and read and respond to posts by other forum members. A forum can be focused on nearly any subject and a sense of an online community, or virtual community, tends to develop among forum members.
Google for Education	As part of Hwb, Google for Education is freely available to pupils, staff and governors. It is a collection of digital tools designed to host and distribute digital documents, communication, and collaboration through cloud-based technology.
Hwb	The Welsh Government Hwb platform hosts a national collection of digital tools and resources to support education in Wales. This includes Microsoft Office 365 and Google for Education, which are freely available to pupils, staff and governors. As part of Hwb's Office 365, Skype is available for teachers only.
Hwb's Office 365	This is part of the Welsh Government Hwb services for schools and provides access to familiar Microsoft Office tools from virtually anywhere.
ICT	Information and communication technology
INSET	In-service training days for teachers
Kodu	This is a free visual programming language made specifically for creating games. It is designed to be accessible for pupils and introduces the logic and problem solving of programming.
LiDW grant	Learning in a digital Wales grant to improve network infrastructure
Literacy and Numeracy Framework (LNF)	This is a skills framework developed by the Welsh Government. It became statutory in schools from September 2013. It is designed to help teachers embed literacy and numeracy into all subject areas.

Network infrastructure audit	Within this report, this involves checking the speed of the internet delivered to the school and the speed with which it is delivered across the school and identifying anything that hinders delivery across the school. It also involves checking whether the wireless functionality across the school is robust and dependable enough to support the growing number of devices that depend on WiFi.
Pioneer schools	Schools that are currently working with Welsh Government and other schools to develop and pilot a new curriculum for Wales
Podcast	The term derives from 'broadcast' and 'pod' from the success of the iPod, as podcasts are often listened to on portable media players. Simply, a podcast is a digital media file that is downloaded directly from the internet. The media files are downloaded onto a computer and then downloaded onto a digital media device like an iPod or other MP3 player. Podcasting lets you automatically receive the latest episode of your chosen radio programme as soon as it is available or access older programmes.
Portable technologies	A generic term for using tablets, mobile phones etc in schools
Professional learning triads	Teachers work in groups of three to develop their understanding and to improve the provision and / or outcomes for their pupils.
QR code	Simple, scannable images that are a form of barcode. By scanning a QR code using a mobile device, such as a tablet or mobile phone, a variety of information can be accessed. This can be text, links to web-based materials, bookmarks and email addresses.
Regional consortia	There are four regional consortia in Wales: Central South; South East Wales; ERW; and GwE. They complement the work of local authorities, allowing them to share good practice, knowledge and skills, and build capacity.
Scratch	A free visual programming language, which allows pupils to create their own stories, games, and animations, and share them with others
Server	A computer designed to process requests and deliver data to another computer over the internet or a local network
Skype	Skype is part of Hwb's Office 365 and allows users to communicate by voice and / or a webcam, or instant messaging. However, Skype is only available to teachers.

SQL	Computer programming language
Successful Futures	In March 2014, the then Minister for Education and Skills, Huw Lewis, asked Professor Graham Donaldson to conduct a fundamental review of curriculum and assessment arrangements in Wales from foundation phase to key stage 4. The resulting report, Successful Futures (Donaldson, 2015), outlines proposals for a new curriculum, which builds on the many existing strengths of Welsh education, and aims to provide a vision for the future and a means of realising that vision, which is coherent and manageable.
Vlog	A video log or video blog
Welsh Baccalaureate	A qualification for 14 to 19 year old students in Wales. It combines personal development skills with existing qualifications like A levels, NVQs and GCSEs to make one wider award.
Wi-Fi	Also called wireless connectivity – this is the technology that allows computers and portable devices to connect to the internet without wires.

Numbers – quantities and proportions

nearly all =	with very few exceptions
most =	90% or more
many =	70% or more
a majority =	over 60%
half =	50%
around half =	close to 50%
a minority =	below 40%
few =	below 20%
very few =	less than 10%

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