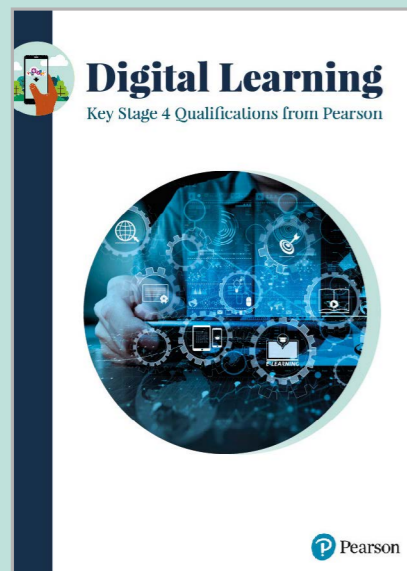# A qualification for every digital path

No matter which path your learners want to follow, a solid foundation in digital skills can help them progress beyond the classroom into their chosen career or next steps in education.

Ensuring learners are equipped for success

We've developed a range of Key Stage 4 digital qualifications across our GCSE and BTEC portfolios, designed to help your students develop those all-important digital skills. We're here to help you discover and determine the ideal pathway for your individual learners. And we'll be there to support you, every step of the way.

Visit us online for more information:
go.pearson.com/ks4digital

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Skills for a digital future

What are the digital skills that today's young people need to thrive in the future? This supplement considers how the new Pearson Edexcel GCSE (9-1) in Computer Science can prepare students for the modern world

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Digital skills and employability

The landscape of digital skills is constantly changing and, as such, qualifications and schools are adapting to prepare learners for the modern world...

The world of work is changing. Young people are expected to enter the workforce with a wider range of skills than ever before – and so the role of the classroom is changing, too.

More than 80 per cent of advertised openings across the UK require some level of digital skill (Nania et al, 2019) and company leaders often claim they are struggling to find digitally skilled employees – so raising digital skills throughout schools and throughout the UK will drive up opportunities for economic and personal growth.

Indeed, the *Working Futures Evidence Report 2012-2022* from the UK Commission for Employment and Skills warns that an estimated additional 1.2 million people with specialist digital skills will be required by 2022 (UKCES, 2014).

Digital skills
Digital literacy is all about the digital skills we need for success now and in the future. It is about developing the knowledge and abilities to help us stand out to employers. By developing these skills in their formative years, students can be better equipped to face the digital challenges of the future – and it enables teachers to enhance their own digital skills too.

As companies invest more in online products and services, students need to make sure they are equipped with the knowledge and skills to keep up with the speed of change. In fact, 76 per cent of CEOs are concerned with the availability of digital skills in their workforce (PwC, 2018).

Defining employability
Employability is not about funnelling people into a specific job. It is about the skills we need as people for success now and in the future. It is about being fulfilled and engaged in a rewarding career that helps you grow in ways you may not even have imagined.

Students and teachers, along with the rest of us, are entering a period of reflection and reinvention caused by the Covid-19 pandemic, and therefore may choose to focus more on building skills for a career in a digital, global, more technological world.

That future may bring a renewed focus on careers carried out via remote working, furthering the trend towards asynchronous work and a growing demand for workers who are able to carry out their roles independently. Key to success here will be communication skills and the development of robust working approaches – and ensuring students are prepared for the lifelong learning that the changing workplace demands.

Computing and digital skills are integral to learning; we are all working and learning more online. So perhaps now is the time to take a look at what we teach and learn, and where new opportunities lie.

Digital qualifications
Pearson offers a range of digital qualifications across GCSE, BTEC and A level to help develop those all-important skills in your students. Whether they are aspiring software developers, digital media producers, or just need to develop a broad overview of IT skills, there is a pathway for everyone.

Our new GCSE in Computer Science develops and refines the skills needed for a digital career, regardless of industry or employer. It encourages students to develop an understanding of emerging trends in computing technologies, and the impact of computing on individuals, society and the environment, including ethical, legal and ownership issues.

Crucially, it demystifies the hidden, secret part of the technologies that everyone uses by giving students hands-on experience in creating their own coded solutions to problems. In addition, our new on-screen assessment will give students a practical and engaging assessment experience that can be transferred into real world skills.

As Matt Hogan, learning manager (secondary) at Raspberry Pi, said: "The practical on-screen assessment approach will prepare students well for eventual employment ... being given two hours to complete a task also relates well to the real-life constraints experienced by many computer scientists."

Meanwhile, our BTEC in Creative Media Production is an exciting multimedia qualification that teaches learners about app creation, games design and web design while exploring industry-related scenarios. We offer a BTEC in Digital Information Technology too – more on that later.

What role do schools play?
Schools prepare their students for life after school with careers information and advice as well as by helping them to develop and grow and aspire for future success.

To this end, the latest Ofsted Education Inspection Framework (EIF) marks a significant shift, with a greater focus on education that promotes a broader knowledge-base and the skills that prepare students for future learning and employment.

In this regard, digital skills should not be looked at in isolation from other skills. While a knowledge of technology is important, there is a real need for students to simultaneously develop interpersonal and softer skills too.

To develop and showcase their employability skills, schools can offer Pearson Future Skills for Employability, a new Future Ready framework, a suite of resources and a qualification designed to equip today's learners with the future skills needed to flourish in tomorrow's world of work.

Students earn a qualification recognised by universities and employers – they gain 28 UCAS points – as well as the opportunity to select their own area of interest for in-depth study.

Ready for the workplace
Encounters with the world of work can change attitudes and improve academic achievement. The report *Motivated to Achieve* (Kashefpakdel et al, 2019) shows how putting time and effort into careers and employment advice can raise engagement and attainment.

In developing our new GCSE in Computer Science, we have worked with teachers to provide a qualification that ensures students have the computational skills they need for a digital future – providing that first step to becoming computer scientists.

We have also worked with industry partners such as Microsoft MakeCode to create aspirational careers videos and show students where their GCSE Computer Science qualification can take them.

The new qualification has been crafted to enable a reliable consistent, practical and accessible foundation in the subject of Computer Science. The strong ethos in the way the qualification has been put together ensures that students are given the skills and tools to understand the subject of Computer Science.

We have chosen Python as the vehicle to enable them to progress into the practical application of the theory. Python is growing in industry acceptance, and we wanted a free, open source, accessible and syntax-friendly language that everyone can access.

Our BTEC Tech Award in Digital Information Technology is also an excellent stepping stone to careers like IT project management, technical support and cyber-security, and is supported by telecoms giant BT. Simon Pykett, BTEC IT teacher at UTC Plymouth, said: "It's so up-to-date it gives every single student the opportunity to learn current standards in IT."

This qualification gives students knowledge and hands-on experience of the workings and value of big data – something every learner and citizen will need to have because the world we live in increasingly sees data as the new currency. In both the BTEC Tech Award in DIT and GCSE Computer Science, we apply real-life context to make the content and skills more accessible to students – and to inspire them to progress.

ℹ **RESEARCH & REFERENCES**

▶ Kashefpakdel et al: *Motivated to achieve*, Education & Employers, June 2019: **http://bit.ly/2Mf95WY**
▶ Nania et al: *No longer optional*, Department for Digital, Culture, Media & Sport, June 2019: **https://bit.ly/2EUp6OR**
▶ PwC: *The talent challenge*, 2018: **https://pwc.to/3gCttfo**
▶ UKCES: *Working Futures Evidence Report*, March 2014: **https://bit.ly/2DwiDt4**

ℹ **DIGITAL QUALIFICATIONS**

You can view Pearson's portfolio of digital qualifications via: **http://bit.ly/seced-pearson**

▶ GCSE in Computer Science: **https://bit.ly/3i0oQw8**
▶ BTEC in Creative Media Production: **https://bit.ly/3i6OIvB**
▶ BTEC Tech Award in Digital IT: **https://bit.ly/2EOqEKx**
▶ Future Skills for Employability: **https://bit.ly/3k948fe**

Tim Brady

... is subject advisor for Computer Science and ICT at Pearson

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ℹ **DIGITAL SKILLS PODCAST**

Tim Brady and other experts will be discussing the teaching of digital skills in a *SecEd* Podcast due to be published on September 16. Listen for free via **http://bit.ly/seced-podcast**

How can Pearson Edexcel's new GCSE in Computer Science – being taught from September 2020 – bring digital skills to life for young people?

GERT BIESTA, in his book *The Beautiful Risk of Education* (2015), says that there are at least three domains in which education functions and, therefore, three domains in which the purposes of education can be expressed.
- Qualification – to do with the acquisition of knowledge, skills, values and dispositions.
- Socialisation – to do with the ways in which, through education, students become a part of existing traditions and ways of doing and being.
- Subjectification – to do with emancipation and freedom and the responsibility that comes with freedom.

Meanwhile, in his SSAT pamphlet *Principled Curriculum Design* (2013), Professor Dylan Wiliam sets out four purposes of education:
- Personal empowerment.
- Cultural transmission.
- Preparation for citizenship.
- Preparation for work.

Both Biesta and Wiliam concur, therefore, that education exists to prepare students for the next stage of their education, employment and lives.

Ofsted also makes this point. The Education Inspection Framework (2019) states that a school's curriculum should be "coherently planned and sequenced towards cumulatively sufficient knowledge and skills for future learning and employment".

Of course, education is not just about ensuring students are "work-ready", it is also about arming students with academic knowledge and enriching young people with an appreciation of the arts and culture.

But, by definition, ensuring students are work-ready is a key responsibility for schools and thus the curriculum must provide for the development of students' employability skills. And this rather begs the question of which skills employers expect school-leavers to acquire.

The learning company and awarding organisation Pearson has identified four areas that make up employability, based on formal and informal research with employers, educators, and learners:
- Core academic competencies.
- Occupational competencies.
- Personal and social capabilities.
- Career knowledge and transition skills.

In terms of occupational competencies, since the world is becoming increasingly reliant on IT, digital skills are crucial and must therefore form an integral part of this aspect of employability.

As mentioned in the article above, Pearson offers a range of digital qualifications including GCSEs and BTECs to help develop these all-important employability skills.

Whether students are aspiring software developers, digital media producers, or just need to develop a broad overview of IT skills, Pearson aims to offer a pathway for everyone.

For example, the GCSE qualification in Computer Science involves studying the theory of a subject combined with investigative work. Pearson has worked with teachers to provide a qualification that ensures students have the computational skills they need to be ready for a digital future beyond the classroom, with a practical focus on real-life programming.

The new GCSE, which is being taught from September 2020, is an up-to-date qualification to reflect the fast-changing world of Computer Science – with innovative, future-looking on-screen assessment to ensure all students develop the key computational skills they need for an fulfilling digital future.

Students will benefit from an exciting, practical focus on programming. The assessments are designed with an underpinning pedagogical approach, derived from the National Centre for Computing Education (NCCE) Hubs, and ensure real-world programming skills are assessed via a realistic, practical and engaging assessment experience.

Pearson has designed its GCSE qualification with a balance of theory and practical application. And, naturally, employability skills are front-and-centre.

They have designed the content of the Computer Science specification to develop the skills that will be most relevant in the workplace, now and in the future.

They will apply real life context to make the content and skills more accessible to students – and to inspire them to progress. The qualification also involves industry links and partnerships.

For full details of the new GCSE in Computer Science and how on-screen assessment will work, turn to pages 4 and 5

ALL IMAGES: ADOBE STOCK
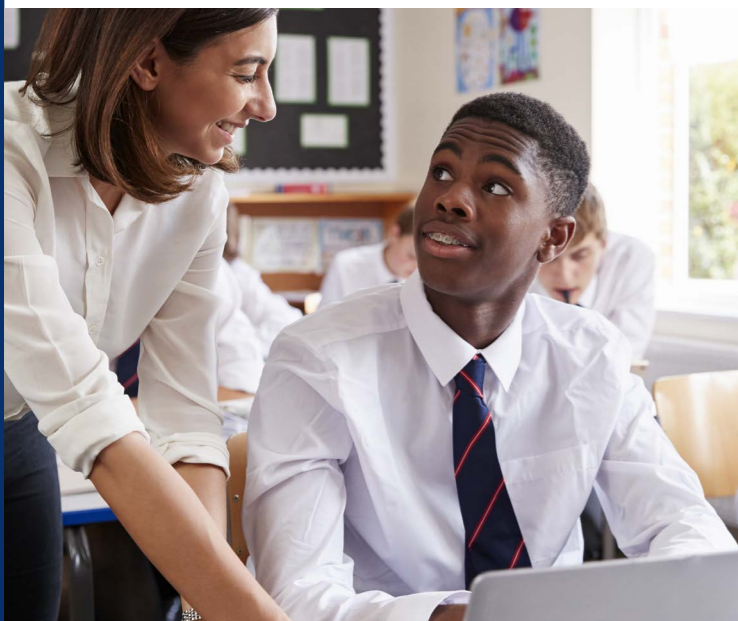
New-look Computer Science

Pearson Edexcel's new GCSE in Computer Science puts employability and problem-solving skills at the heart of students' learning – creating a generation of problem-solvers

Pearson Edexcel's new GCSE in Computer Science, which is first being taught from September 2020, is one way to help ensure students are equipped with the employability skills they need both now and in the future. So, what does this qualification look like?

The qualification is 100 per cent terminal assessment and there are two examination "papers", the second taking the form of on-screen assessment.

Paper 1

Paper 1 is about the principles of Computer Science. It is worth 75 marks and takes the form of a written examination of 90 minutes. This equates to 50 per cent of the qualification. Paper 1 assesses topics 1 to 5 of the qualification:

1. Computational thinking: Understanding of what algorithms are, what they are used for and how they work; ability to follow, amend and write algorithms; ability to construct truth tables.
2. Data: Understanding of binary, data representation, data storage and compression.
3. Computers: Understanding of hardware and software components of computer systems and characteristics of programming languages.
4. Networks: Understanding of computer networks and network security.
5. Issues and impact: Awareness of emerging trends in computing technologies and the impact of computing on individuals, society and the environment, including ethical, legal and ownership issues.

The paper consists of five compulsory questions, each one focused on one of the topic areas. The questions consist of multiple-choice, open-response, and tabular and diagrammatic items.

Paper 2

Paper 2 is about the application of computational thinking. It, too, is worth 75 marks and accounts for 50 per cent of the qualification. It is assessed by means of a practical on-screen examination of two hours.

The main focus is understanding what algorithms are, what they are used for and how they work in relation to creating programs; understanding how to decompose and analyse problems; and the ability to read, write, refine and evaluate programs.

The paper is practical in nature and requires students to design, write, test and refine programs in order to solve problems.

Students will complete this assessment on-screen using their Integrated Development Environment (IDE) of choice.

They will be provided with: coding files, a hard copy of the question paper, and a PDF booklet called a Programming Language Subset (PLS).

What will students learn?

By studying the GCSE, students will be able to develop skills in understanding hardware and software components, computer networks and security, what algorithms are and how they work, understanding and interpreting different data types, and being more aware of emerging trends in computing technologies.

The qualification will provide students with a perfect first step into the digital world, helping to develop skills and knowledge that future employers will look for. Students will develop problem-solving skills, work with coding and computers, all while improving their programming skills and ability to write code in a practical fashion. Once they have completed the qualification, students could go on to study Computer Science at A level, BTEC Level 3 National in Computing, apply for an Apprenticeship, or get started in an entry-level role in the digital industry.

Why Computer Science?

In 2016, the government decreed that GCSEs in ICT should cease and that Computer Science should take its place. This new qualification, the government said, should be 100 per cent externally assessed.

Tim Brady, Pearson's subject advisor for Computer Science and ICT, explained that Computer Science was reintroduced as a way for the UK to "regain leadership in innovation related to computing". He continued: "It is a worthy area of study as students who access the content will go into their adult lives better informed about the technology and the science behind so much of what pervades the modern world – especially the working world."

At its core, Computer Science is a "problem-solving" discipline according to Mr Brady. He added: "These are core skills that will

> ❝ *Successful students will not necessarily go on to become programmers, but they will all be problem-solvers* ❞

benefit students no matter what path they choose for progression. Additionally, they will be taught how Computer Science has developed and continues to develop in order to try to solve the ever-growing challenges of an uncertain future.

"Successful students will not necessarily go on to become programmers, but they will all be problem-solvers – and these students will not be intimidated or baffled by the systems that govern the great problem-solving challenges, such as artificial intelligence or data-mining.

"All these will be seen for what they are by students conversant in the language of Computer Science – as an understandable extrapolation from what they have learnt during their GCSE."

View from the chalkface

Dr Andrew Middleton, director of Computer Science at Holmes Chapel Comprehensive School in Cheshire, said that prior to the introduction of this qualification his contacts in the industry were "despairing at the lack of decent programmers coming through the pipeline from schools".

Computer Science, Dr Middleton said, has become "vital to the future economic health of the nation". He added: "It is the key shortage skill worldwide and the most in-demand skill in the jobs market."

Of course, it is not just about going to work for a big tech giant, nor is it about becoming an entrepreneur. Rather, Computer Science education will become "as essential for life in the next 100 years as learning to read or do basic maths is now".

Karen Bennett, head of computing at Guru Nanak Sikh Academy in Hayes, meanwhile, explained that although ICT has long been a part of the curriculum, the industry did not feel that students were emerging with appropriate computing skills. The introduction of Computer Science is part of the answer and addresses this need for students to "understand how computers work and have some programming experience".

While Ms Bennett says that the new subject has been "introduced rapidly without thinking about the lack of skills within the teaching community", she is "genuinely excited about the new specification because it ticks all the boxes and offers fairness".

She added: "There is something in this spec for all students – a great blend of practical and theory – definitely bringing the qualification to life and making it relevant for life."

Effective on-screen assessment

Pearson Edexcel's new GCSE in Computer Science offers an innovative mix of terminal examination and on-screen assessment. But how will this work in practice?

Pearson Edexcel's GCSE in Computer Science is leading the way in terms of on-screen assessment. The qualification features two examination papers, the second of which is about the application of computational thinking and is assessed with a practical, two-hour on-screen examination.

This is an important development because, as Tim Brady, subject advisor for Computer Science and ICT at Pearson, explained, "problem-solving using a programming language is best assessed by having students actually problem-solve using a programming language" – and to do this with pen and paper in an exam hall is, at best, a compromise.

Pearson's solution, therefore, is to give students a computer and let them use the tools that they will have practised with during their programme of study.

This is not without difficulty, of course. The challenges of on-screen assessment include making assessment reliable, repeatable and consistent, Mr Brady said. These challenges have, at least in part, been solved by using "one language and a very strict set of assessment rules followed by the assessment team". A further challenge for schools is to find enough computers to run the assessment.

To help ensure appropriate safeguards, Pearson has put in place a raft of measures. These are captured in the ICE (Instructions for Conducting Examination) document published on its website.

Dr Andrew Middleton, director of Computer Science at Holmes Chapel Comprehensive School in Cheshire, said that on-screen assessment is "one of the attractions" in the new Pearson Edexcel course – something that made him swap from another exam board.

Dr Middleton recounted how frustrating it has been in the past "to see 'good' programmers get average marks as they get tripped up by the syntax and the trickery of a written exam, while 'average' programmers get good marks by learning a set of standard answers".

And he does not foresee many problems with safeguarding. His school has worked closely with their exams officer as well as Pearson's subject advisor. On-screen testing, he adds, "is a well-trodden path with a clear set of protocols that most centres are very familiar with".

Furthermore, there is a raft of online training that has allowed him to "juggle online lessons, marking work and getting the training and planning done".

Meanwhile, head of computing at Guru Nanak Sikh Academy in Hayes, Karen Bennett, says that "like a written paper, students will have an allocated slot in the exam timetable to sit the on-screen paper". The school already has experience with the on-screen assessments for BTEC.

Ms Bennett added: "We have a cohort of 45 students so they could be accommodated across a number of IT suites with the relevant distances between workstations being observed."

In terms of safeguards, "all display boards will be covered, students will be seated with a spare terminal between them and we will also use green screens to prevent students from being able to see other terminals. A technician will be available throughout the slot to ensure that any issues can be resolved immediately".

In terms of on-screen assessment, no internet connection is permitted or needed. Instead, each centre sets up an exam profile for the student in advance of the examination.

The computer is set up to provide students with the tools required to do their programming. These are the same tools with which the students will have been taught during the two (or three) year programme of study.

Data files will be released digitally to schools on the morning of the exam and school staff then place them in each candidate's user area. Pearson will have at least three channels ready to go to ensure that this works smoothly. These are: secure download from the website, secure download via Edexcel Online, and, if necessary, the team will be on hand to organise a secure file transfer.

The challenge of setting tasks for assessment that are fair and reliable has also led Pearson to adopt a single programming language – Python. This means exam questions can be made increasingly challenging and can be compared series to series very effectively. The choice of programming language was not taken lightly – there are pros and cons to every language.

> ❝ *Paper 2 is really innovative and offers opportunities for a wider cohort of students to be successful* ❞

Pearson chose Python because it is freely accessible to schools, is widely used and is easy to start working with. It frees teachers from having to deliver "pseudocode" as a formal language and there are lots of resources and training available due to its adoption into the education community over the last few years. It is used in industry widely; no company owns or controls it.

To ensure that students are assessed and tracked appropriately through the course, Dr Middleton plans to "set regular vocabulary tests after each unit of work and do short topic-based assessments at the end of each of the five topics".

He will also have regular coding challenges, supported by working with partners in industry, all as part of enabling children to know "where they are at and what they need in order to progress".

Ms Bennett, meanwhile, said that "as part of our scheme of learning, regular assessments – about three a term and an end-of-year exam – have been integrated on a topic-by-topic basis alongside regular Python tests".

She continued: "Central records of results will be held in the schools' assessment system and both class teachers and I will carry out regular data analysis to inform future teaching and learning.

"Paper 2 is really innovative and offers opportunities for a wider cohort of students to be successful. We are looking to develop a series of practice tasks, guided by the sample assessment, to offer students a chance to experience the types of questions they are likely to see."

Ms Bennett says that this qualification gives students "a chance to perform in the programming side of the subject". She added: "Programming is both an exciting field and one in which there are likely to be jobs in the future. Most young people like YouTube, gaming, 'living the online life' and therefore Paper 2 is really relevant to their life experiences and an area which they are keen to explore."

Dr Middleton is excited to start teaching the course in September: "I love the way that Pearson is only setting five overarching questions and that each question will be on one of the five topics on the syllabus. The thematic approach to questions also helps students to know what to write about."

He is most excited about the coding elements: "There is nothing more exciting and fulfilling than being able to take something that is an idea in your own head and then building it."