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The inside story

Ethan Nyholm | STM

Ethan Nyholm, co-founder and chief executive of Sydney-based STM, explains why success has been a learning experience

Education is in STM's DNA. It was while he was at university that co-founder Ethan Nyholm approached his business partner-to-be, Adina Jacobs, with one of those simple-solutions-to-a-practical-problem that nobody seems to have thought of: "I had a brand new laptop and – short of one of those old black briefcases – couldn't find anything to carry it in," he remembers. "This was back in 1998. There were no iPads, laptops were very expensive and everything you had was on there. I thought there had to be a better way.

"I ended up buying a bubble wrap envelope and throwing it inside my backpack – and that's where the original concept came from: a bag that offered protection and didn't scream out 'laptop'. And it sort of went from there."

With no previous business experience, Ethan developed the idea alongside his studies: "I was doing business and accounting, so most of my university assignments were done on STM," he laughs. "It was really neat to be able to learn something, then take those lessons and actually apply them – you don't often get to do that."

Hard work, and a little luck

Connecting with customers was another learning experience for Ethan and Adina, and it required plenty of hard work. "Overnight success takes 20 years, right?" Ethan jokes. "We worked out of our garage, and used to go through the phone book to find luggage stores and computer stores to approach. People think it's simple, but it's not!"

Some sales to PricewaterhouseCoopers earned the fledgling brand a presence around Sydney's central business district, before a happy coincidence provided another boost. "In the late 90s Apple launched a range of coloured clamshell laptops, and the colours of our bags just happened to match them," Ethan explains. "We came upon that market by accident really, but have been intertwined with it ever since."

STM's development has gone hand in hand with the rise of the iPad, in particular, and as Apple's tablet, and subsequently the likes of Microsoft's Surface devices and Chromebooks, have been embraced by schools, Ethan and his team have increasingly focused on the education sector.

Solutions for schools

Just as was the case with his laptop, protecting valuable equipment remains the priority for Ethan: he highlights one of STM's earliest forays into the classroom, a laptop bag known as the Armour – "You could swing this thing against a tree and nothing would happen to the laptop; it was remarkable!" – as well as the expanding Dux range, which is drop-tested to US military specifications, no less.

But, he stresses, it's also about functionality and ergonomic good looks. "You want kids to feel comfortable with their cases," he says. "If they don't like them, they're going to abuse them and they won't treat the device itself with care. At the same time, we work alongside IT departments to understand what their requirements are, and how their devices are being used."

Today, the innovation that has gone into turning STM from a garage-based start-up to a global brand continues, and Ethan is still learning. "One of the things that allows me to stay excited doing what I'm doing after 20 years is this business is changing all the time," he says. "You really never know what's coming next, which is fun!"

More information, visit stmgoods.com or contact uk@stmbrands.com

Timeline highlights

1998
Ethan Nyholm and Adina Jacobs found STM in Sydney, Australia.

2004
The company's UK office opens, giving STM a presence in Europe for the first time.

2012
The popular Dux range for educational settings is launched.

2014
The Ace collection, comprising bags with integrated laptop protection, goes on sale.

CONTENTS

Welcome...

… to another edition of Technology & Innovation, crammed full of cutting edge ideas for brilliant teaching and learning – including the much-anticipated announcement of this year's Tech for Teachers Awards winners, which starts on page 59 and celebrates an impressive range of edtech developments that are already making a real difference in schools throughout the UK. If you're on the hunt for curriculum-linked resources that could reduce your workload and have a real impact on student progress and outcomes, look here first.

There's plenty more to explore, too – on pages 24 to 35, for example, we're shining a spotlight on STEAM, with the emphasis firmly on how important it is to keep creativity and the arts alive in education in order to prepare young people for a future in which increasing automation is already starting to change the shape of both work and leisure beyond recognition. Meanwhile, Martin Baker considers the role that digital records have to play in 21st century safeguarding (p.44); Karthin Krishnan tackles the tricky issue of online credibility (p.50); and Sean O'Dea wonders if better use of technology could help solve the recruitment crisis (p.46).

Oh, and of course we couldn't possibly forget that this issue of T&I comes out just in time to share our excitement about Bett 2019, which is taking place from the 23rd to the 26th January, at Excel London. We've dedicated 12 pages to a special preview of the show, including teasers from Bett Arena speakers; a round up of what's on offer for those looking to support learners with SEND; and a survival guide with tips for making sure that if you are going to attend, you get the most out of your visit. The T&I team will be there as usual, alongside our colleagues from Teach Secondary, Teach Primary and Teach Early Years, at stand F101; if there's anything you'd like to tell us about any of our magazines, please do drop by – we'd love to hear what you have to say!

Best wishes

Helen Mulley, editor
@teachwire

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IN THIS ISSUE...

Elevator PITCH

Take two minutes to find out why schools love LocknCharge...

1 Time-saving baskets

allow teachers and students to quickly, safely and easily distribute devices every day, putting 2 hours of class time per week back in the hands of teachers.

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5 Future-proof designs

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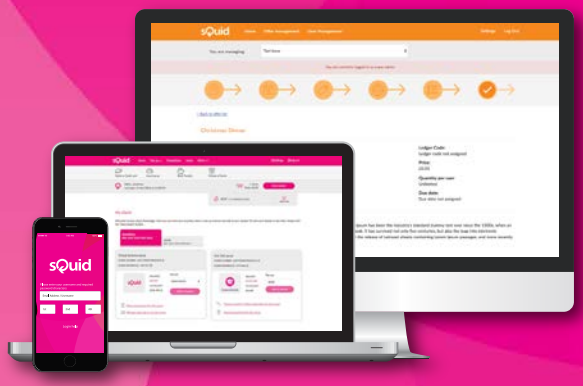

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George Spencer Academy, Nottingham

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"GCSEPod was of such great value at my previous school that there was absolutely no doubt that I wanted to get it in at my new school as a matter of high priority."

Hayley Clacy - Headteacher, Spen Valley

A division of soundbite learning education on demand

THE T&I BETT 2019 PREVIEW

BETT 2019
23-25 JANUARY
EXCEL LONDON
T&I will be there; will you?

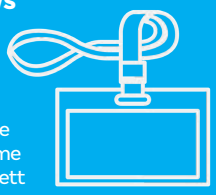
Grab a taste of what visitors to the UK's leading edtech show can expect from this year's event...

IN THIS SECTION

teachwire.net

WHAT'S NEW FOR 2019?

1 BADGE, 2 SHOWS



With a focus on school efficiency, the Education Show is moving alongside Bett at the ExCel for the first time in 2019 – and your Bett registration lets you access all areas, so you can save valuable time and find all the knowledge, resources and suppliers you need to make your school a success, all under one roof.

LEARNIT

This year, Bett will also be coinciding with Learnit, a brand new conference for the global learning ecosystem, exploring current state and future of learning around the world. Learnit will be taking place January 23-25 at the QEII Centre and Central Hall in Westminster, bringing together over 150 international speakers.

PEER-TO-PEER CONNECT

Responding to visitor feedback requesting a dedicated networking space, the organisers are arranging a separate area on the show floor exclusively designed to bring together educators; it will be somewhere to meet away from the crowds, to relax and share information.

BETT LATES

Again, as a result of requests from previous attendees to make content available outside of traditional show hours, evening seminars will be taking place on Tuesday, Wednesday and Thursday from 6pm. These after-hours sessions include a Teach Meet hosted by tech advocate and influencer Mr. P, and a new Edtech Surgery hosted by influential edtech practitioners Neelam Parmar, Matt Harris and Abdul Chohan.

Find out more, and register, at bettshow.com – it's FREE!

REALITY *checks*

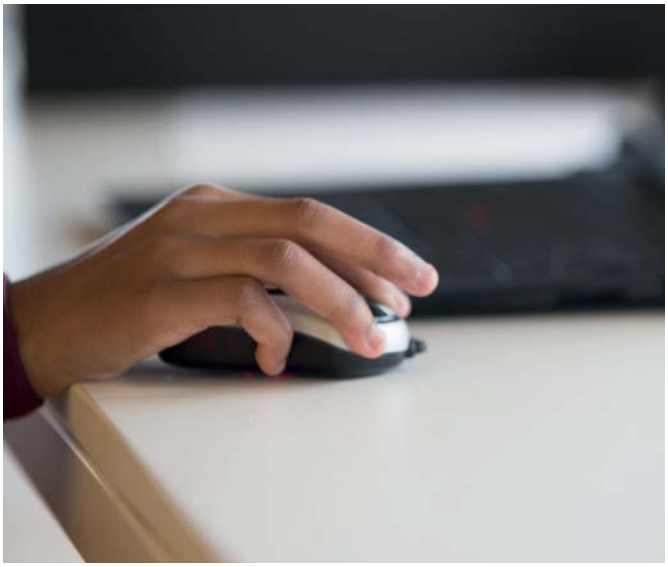
Digital criticality requires specific skills, insists Bett speaker **Sarah Horrocks** - and it's down to schools to make sure young people develop them...

A recent survey of 1500 adults in the US earlier this year by The Economist and YouGov found that seven in ten Americans felt confident that they could discern real news from fake news. Of course, as adults we can often overestimate our ability to navigate the digital world safely. What is more, this study raises the question: why do fake news stories gain such presence online in the first place?

The unfortunate allure of fake news is that it can appear more novel and emotionally stimulating than real news. A study that appeared recently in *Science* found that the strong emotional reactions of readers led them to share fake news at a much higher rate than verified news stories. As the poet Horace of Ancient Rome said, "nothing is swifter than rumour". And in today's world, this still rings true.

Fresh challenges

We must bear in mind that millennials and baby boomers did not grow up in the fake news era. Young people today are facing an entirely different set of challenges and influences from the online world. The National Literacy Trust Fake News Commission highlighted this issue, revealing that as few as 2% of children have the critical literacy skills needed to be able to discern a fake news story from a real one. This appears to be damaging future generations' confidence in the media overall: nearly two thirds of children surveyed said they now trust the news less, because of the prevalence of fake news.



The Commission also found that half of the teachers surveyed felt the national curriculum is not equipping young people with the skills required to spot fake news. Whilst criticality has a place in all subjects across the national curriculum, we need to be sure that critical thinking extends to digital media and online news.

Professor Sonia Livingstone, Chair of the LSE Truth, Trust and Technology Commission, has pointed to the importance of digital criticality becoming a more explicit part of the curriculum. Whatever the name given to the critical thinking skills needed online (media literacy, digital literacy, digital criticality etc.), it's clear that specific policies and resources must be allocated to improve the awareness of the public at large.

Advanced understanding

First of all, what do we mean by 'digital criticality'? Just as is the case with other forms of criticality, it is all about deduction, inference, imagination and questioning. But the digital element demands new skills aligned specifically with technological advancements.

First things first, the way that text appears on a web page makes for a whole new ball game of information creation and display. Digital criticality requires awareness of features like URLs and HTML that are specific to online news. Children specifically need to understand what HTML is so that they can appreciate what web pages are and how they are built, since they have not witnessed the divergence between online and traditional print in the same way adults have over recent decades.

There are many other features that come into play when the thinking about online media. Unlike traditional print media, a large proportion of online content is not independently verified or fact checked. Whilst the internet is visibly a democratising force, allowing a voice for everyone, the downside is that sorting fact from fiction is made much more challenging. Experts are now less trusted than in the past, despite their credentials and training in specialist knowledge.

Highly recommended

It is also worth recognising that the online world is more than just text: much of the information young people gain online is through images and video. We can't fully trust our eyes and ears in the online world, with the risk of visual and audio manipulation rising as technologies become more sophisticated.

Crucially, genre and context markers that help us understand a report can be blurred in the online world. Who is the author? What angle are they coming from, and what is their agenda? Are they trusted and respected? With the appearance of many more independent voices, more work is required to figure the source out, and work out whether it can be trusted.

Algorithms reign supreme in the 21st century. Content 'recommended for you' by artificial intelligence is often designed to improve our experience online. However, it can have the unintended consequence of reinforcing our existing biases. Algorithmic bias may unintentionally limit our scope of criticality if the content we consume already fits with our underlying worldviews.

It's about trust

Digital criticality brings to light the uncomfortable reality that there are actors out there who are purposefully fuelling misinformation. The inherent risk is that young people can feel alienated from all media. By undermining credible news outlets, fake news it can harm democratic culture itself. Citizens can grow to lose trust in the very journalists who work to uphold the free press – a pillar of modern democracy.

But we need to recognise that improved digital criticality is part of the remedy for this subversive force of misinformation. If children are able to work out which sources are trusted, and which are unreliable, we can ensure that the next generation can participate fully in democratic culture and help shape a better future for the countries they live in.

These skills can be taught and developed in a way that avoids inspiring fear and anxiety: this will be the core of my talk at Bett. My session will highlight some of the ways we can ensure young people are left with greater confidence and resilience.

I'm looking forward to a number of other presentations at Bett related to this topic, too. For example, Discovery Education's session with ITN Productions and The Institute for Strategic Dialogue looks to be another valuable session, on the topic of equipping children with the skills to tackle fake news. The Economist Educational Foundation will also be looking at best practices for teachers to discuss news in the classroom. All eyes, we hope, will be on the digital media this year!

DON'T MISS THIS!

FACT OR FAKE: DEVELOPING CRITICAL LEARNERS IN THE DIGITAL AGE

FRIDAY, JAN 25TH

BETT ARENA

13.30

As the digital economy grows and the political landscape evolves across the world, the role of traditional media is being disrupted by new – and sometimes malicious – voices vying for our attention. This will be the focus of Sarah Horrocks' session at Bett; specifically on how we can equip children and young people with the critical thinking skills needed to deduce fact from fiction online.

ABOUT THE AUTHOR
Sarah Horrocks is director of London Connected Learning Centre

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Calling all teachers of computing...

Discover the new National Centre for Computing Education

The National Centre for Computing Education (NCCE) is a government-funded programme of training and support for computing education. It is being run by a consortium of STEM Learning, Raspberry Pi Foundation and BCS (The Chartered Institute for IT) and will work to improve the provision of computing education in England, with specific support for GCSE and A level computer science.

The vision of the NCCE is a world-leading computing education for every young person, providing them with the knowledge and skills they need to thrive economically and socially. The comprehensive package of support comprises:

- A National Centre for Computing Education and established network of Computing Hubs to provide continuing professional development (CPD) and resources for computing teachers in primary and secondary schools and colleges, and facilitate strong links with industry
- A teacher training programme to upskill existing teachers to confidently teach GCSE computer science
- A programme to support AS and A level computer science students and teachers with high quality resources and CPD

WHAT ARE THE BENEFITS?

The National Centre for Computing Education gives teachers access to a one-stop shop for computing education. It offers:

- Free courses and training to give you the skills and confidence to teach the curriculum
- a comprehensive range of blended learning, giving you the chance to work around priorities
- generous bursaries to help you reach your development goals
- easy access to resources you need for planning and delivering lessons
- local support provided regionally

There are a range of face-to-face courses now available aimed at the completely new-to-GCSE teacher, to advanced courses for more experienced teachers who are aiming to stretch and challenge students and hone their subject.

COMPUTER SCIENCE ACCELERATOR PROGRAMME

The Computer Science Accelerator Programme, from the NCCE, is a personalised professional development programme, designed to support secondary teachers of computing or computer science without a post A level qualification in computer science or a related subject. If you teach GCSE computer science, or you'd like to, then this is the programme just for you.

With generous bursaries available, teachers will be supported to complete 40 hours of blended learning, both face-to-face and online. As part of the training package, a range of courses have been designed to provide young people having the digital skills they need and more engaging with GCSE computer science.

FACE-TO-FACE COURSES

- Python programming essentials for GCSE computer science Go from novice programmer to competent teacher of Python programming.
- Algorithms in GCSE computer science Focus on core search and sort algorithms and discover how they manipulate data.
- Data and computer systems in GCSE computer science Understand computer systems and data, exploring the components of a computer.
- Networks and cyber-security in GCSE computer science Demystify the numerous protocols, network topologies and key applications used for data transfer between computers.

ONLINE COURSES

As part of the programme, there are a number of online courses, free for all teachers on the FutureLearn platform. You will be supported by experienced lead educators to master skills and pedagogy, at your own pace, in the comfort of your own home or school. Some courses are already available, with more coming online in the next few months.

What next? Stride confidently into the future of computing today and access the support you need: www.teachcomputing.org

The FUTURE of learning

The world of work will never look the same again, says Bett speaker Joysy John – so how can we best prepare young people for what lies ahead?

Economies across the globe are being transformed, thanks to technologies like artificial intelligence, robotics and cloud computing. And automation is only one part of the story; equally important are other interacting trends including: changing demographics, urbanisation, globalisation, inequality, political uncertainty and climate change. Nesta's Future of Skills 2030 report, in collaboration with Pearson and Oxford Martin School, shows what skills will be in high demand in the labour market moving forwards. We found that around 10% of the UK workforce are in occupations that are likely to grow as a percentage of the workforce. This includes education, healthcare and wider public sector occupations.

On the flipside, a fifth are in occupations that are likely to shrink. For the remaining 70%, the future of these occupations is uncertain. Advances in technology mean that many aspects of jobs today could be automated. This therefore places a question mark above many job roles that exist today.

The transformation of the job market means that we must be clear on which skills are likely to be a priority for employers. The research suggests that interpersonal skills, and other higher-order cognitive abilities – like creativity and problem-solving – will see a rise in demand in the future. Some use the term 'soft skills', but referring to 'future ready skills' helps us keep a sense of perspective on the ongoing transformation of the world of work.

Future ready skills will ensure people are able to complement the work carried out by advanced automation software. However, our research into digital skills found that not all digital skills will have the same value in the coming decades. Competency in animation, multimedia and design engineering, for example, are likely to be in greater demand. Less promising digital skills include data input, clerical duties and accounting processes – all quite likely to become the domain of automated technology solutions

As many observers have pointed out in recent years, the current model of schooling in the UK remains too stubbornly focused on exams. Academic outcomes of school are of course important, but young people's educational careers shouldn't be entirely wedded to a results culture.

In a highly automated workplace, people will need to demonstrate the ability to adapt – regularly upskilling where needed. This requires a degree of resilience to accept that a 'job for life', or even a 'career for life', is no longer viable.

Think bigger

The onus to adapt does not fall solely on young people: it is our job to instil the qualities and behaviours needed – that means adapting our current educational model. First, we have to make sure students are aware of the skills employers are looking for. Policymakers and funders should provide support for schools to identify which interventions can help bring about the future proofing of the next generation. Teachers and school leaders should test out high quality interventions and make better use of evidence.

Departments across schools will need to think in a multidisciplinary way: how can drama work with science, and how can art complement maths?

This could be easier said than done. Teachers frequently feel overworked and under-resourced; we need to think of ways we can make educators' lives easier, and allow them to help each and every young person to think critically and apply their knowledge. We need to enable teachers to build a culture of curiosity in their students that will facilitate life-long learning to thrive in a fast changing world of work.

Businesses will also have a role to play here. Career fairs, talks at schools, mentoring and work placements are all routes to achieve this. Apprenticeships, too, will be a vital piece of the puzzle.

Equally, parents and peers of today's young people will have to be part of the transformation. Thoughtful conversations are to be had around whether university is the

"Thoughtful conversations are to be had around whether university is the best route"

"There is evidence that real change is not only possible, but is gaining ground"

most appropriate route, or whether an apprenticeship will lead to a better outcome. Everyone must be willing to make a clear business case for the many different pathways that exist, focusing on destination outcomes, rather than received wisdom alone. Only then can we tackle the future head on, and with responsibility.

Here and now

Let's be clear, these aren't just aspirations: there is evidence that real change is not only possible, but is gaining ground. A survey by Bett earlier this year found that 46% of teachers have already adopted STEAM learning techniques in some form, driving the integration of arts-centred skills such as creativity and critical thinking into science, technology, engineering and maths.

The research also suggested that nearly half of those surveyed had adopted problem-based learning, where classroom tasks focus on solving real world problems. For example, designing an environmentally-friendly transport system, or an initiative to reduce cyber bullying in schools.

Up and down the country, organisations are working to support schools. Nesta's Future Ready Fund, for example, provides resources for early-stage interventions for secondary school and college pupils, to develop social skills and emotional resilience. And in Camden, employers have signed up to the STEAM 21st Century Talent Pledge, giving young people access to internships and apprenticeships within the borough's creative and knowledge economy. Ted Baker has also been actively engaging young people with its Camden Challenge, inviting 13 to 15-year-olds to compete in a Dragon's Den business challenge.

I was lucky enough to attend Nacue's 9th Varsity Pitch, revealing the importance of infrastructure and signposting to support youth entrepreneurship. Nacue helps provide young entrepreneurs and startups with access to accelerators and funding opportunities. It is just this kind of programme that will help young people understand that finding a job isn't the sole option: youngsters can also start to build their own businesses.

Inspiring conversations

Many of us who share this vision will be gathering at Bett in January to discuss the way forwards. For example, Simen Spurkland of Vøyenenga Upper Secondary School will be sharing his experiences of releasing students' creativity and ownership in the classroom. The University of Buckingham's vice-chancellor Sir Anthony Seldon will also discuss how to place creativity at the centre of learning. Through open dialogue and sharing of best practice, we can remind ourselves exactly what education must achieve: preparing young people for whatever future that awaits them.

When all is said and done, the reality is that no-one can predict the future – as much as we want to. The only sure-fire way to help young people prepare is by building the ability to learn and be resilient. Humans have developed technologies that are likely to displace some of today's jobs. But just as we have cultivated this new reality, we can also adapt and find new ways to remould ourselves, in order to prosper.

DON'T MISS THIS!

HOW TO PREPARE YOUNG PEOPLE WITH SKILLS FOR THE FUTURE

FRIDAY, JAN 25TH

BETT ARENA

17.15

In this session, Joysy John will be sharing some best practices to steer young people in the right direction in a highly volatile, complex and uncertain world. Building a broader set of skills and capabilities alongside specific knowledge will need to be at the core of the next generation's adaptation to the future economy.

ABOUT THE AUTHOR
Joysy John is the director of education at Nesta

Special ATTRACTIONS

Sal McKeown assesses what's on offer at Bett 2019 to support learners with SEND

As a judge at the Bett awards this year I sense a shift towards helping secondary students to learn and less weight accorded to improving teaching; but, as in previous years, there is still strong emphasis on saving schools time and money.

Microsoft (E300 and C300) is a finalist in the Special Educational Needs Solutions category, despite drawing case study evidence from the USA; anyone would think their products weren't being used in UK schools. Their tools are provided free of charge as part of Office 365 and the Edge browser in Windows 10 and include text to speech, display options for background colours, line spacing and fonts, and tools to help with reading and grammar.

Scanning Pens (A230), another special needs finalist, is stressing simplicity and time-saving, claiming that most students can use the pen successfully after as little as one minute. However, it should be remembered that if learners are going to use them in exams, the pens have to be their normal way of working in lessons and for homework, too.

Apps and maps

Claro (A52) is focusing on apps this year, which, according to new MD Alisdair King, "use new technologies from Google and Microsoft to make text-to-speech and speech recognition more personal and more portable." Schools particularly appreciate Claro's ScanPen app, where learners are able to photograph printed text on their phone, which the app reads out, supporting students to be more independent out of the classroom.

MindView mind mapping software from Matchware (C142) is a finalist in the Higher or Further Education Digital Services category. Mind mapping is often used as a prelude to writing but it can also be an effective alternative to conventional handouts. The visual nature of mind maps and the pared down language mean that students with autism, dyslexia and those who are learning English as an additional language can

follow the content more easily and see relationships between different aspects.

MindView is used by two out of three UK universities, often as part of a suite of programs available to all students, and at BETT the company plans to show the schools sector what its software can offer teachers and students.

On track

Schools right across the UK already use the London Grid for Learning (D260) as their first port of call. It brings together key products from different companies such as WordQ SpeakQ, a toolbar that offers word prediction, speech recognition and spoken feedback. Among the LGL's wide range of products is a differentiated set of employability resources with video and audio clips and worksheets. These are ideal for a work preparation programme, moreover, the 'working mathematically' module could help to make numbers more relevant to some disaffected learners.

Meanwhile, a new version of the touch typing program Kaz (D405) will be the first typing tutor to be offered the City & Guilds Assured accreditation. Students work through the course, then take an online multiple choice paper with theory questions and a practical typing test where they need to achieve 35 words/minute, with an accuracy of 80%. Successful candidates get a certificate and City & Guilds Assured digital badge which they can showcase on social media profiles, CVs and job application forms.

Lexplore (B303) is an exciting new technology using eye tracking cameras to identify dyslexia. "Eye movement is one of the best ways to index reading ability at an incredibly in-depth level," explains Julie Kirkby, a psychology professor at Bournemouth University. Good readers have steady left to right movements as they scan text whereas dyslexic readers hop backwards and forwards and do not always land on a line. This could be a very good whole school screening tool.

While you're at the show, be sure to talk to assessment experts Bsquared (C134) about their system to assess progress across Key Stages 3 and 4 covering over 25 GCSE subjects. It can track achievements and predict GCSE grades – and some BTECs – on the new 1-9 grading scale.

Virtual brilliance

Avantis (C205) has teamed up with Inclusive Technology to produce Inclusive ClassVR, a virtual and augmented reality technology that's ideal for visual learners. Its entry for the Special Needs award promises that students can "get up close and personal with static and animated content such as a beating heart, a spitfire, triceratops, planets and many other exciting educational resources." Exciting stuff!

Onvu (E191), a classroom video recording technology, is a strong candidate in the Innovator of the Year category. Research shows that teachers can tend to avoid eye contact with certain students – often the quiet ones, whose needs can go unrecognised. Onvu can pinpoint the teacher's gaze, and there is clear evidence from studies in schools such as Hereford Academy that this technology provides opportunities for teacher reflection and makes for more inclusive teaching (although there are also concerns from schools and unions that it can be used by senior managers as a tool to put pressure on staff; why not see for yourself?)

In addition...

Not at Bett, but a strong contender for the Special Needs awards is Mable (www.mabletherapy.com) which describes itself as 'therapy reimagined'. Research shows that two thirds of 7 -14 year olds with serious behaviour problems have language impairment, but organising speech therapy is complex. Instead of having a visiting speech

therapist, Sencos can use technology to beam therapy into the school and reports suggest that children who have been resistant to traditional therapy can respond well to Mable's online alternative.

This year the Education Show is just across the road from Bett on 24/25th January. It is worth visiting to seek out now>press>play on stand A1, an immersive curriculum themed audio experience using silent disco technology, which is a finalist in the Digital Devices category. Secondary schools have been using now>press>play to develop young people's listening and empathy skills and as a useful jumping off point for discussions and creative writing practice.

Finally, do keep an eye out for seminars. The most relevant for secondary is Accessibility at Apple: Innovating for all delivered by Sara Herrlinger, director, Global Accessibility Policy and Initiatives on 24 January, 12.00 – 12.30.

ABOUT THE AUTHOR
Sal McKeown is a Bett judge and editor of an assistive technology newsletter.

A space to TEACH

As external pressures on educators continue to rise, why not use technology to take back time for doing what you do best, suggests **Tony Cann**

With my 80th birthday on the horizon, I've possibly spent more years in education technology than most. For me, it all started more than two decades ago when I launched the Promethean interactive whiteboard; by 1995 we had installed the first 50 boards into schools. Today, millions of teachers across the world use the technology.

This should be something to celebrate – but as I now have time to stand back and look at our school system, I have to admit that in some ways, I am disappointed in how things have turned out.

By looking at how teaching has changed over these years, there are many lessons still to be learned. In summary, I believe we are yet to realise that technology in schools is simply a tool for change; it's up to us to use it effectively to enable that change. Let's go back to the start...

Early issues

As technology first started to trickle into schools, the 'early adopters' used it with pride and to a certain extent, pupils were engaged simply because it was new and exciting. But there was very little understanding of how to use the technology effectively in terms of both functionality and pedagogy.

Looking at functionality first, then, the issue is that in most schools 80 percent of any particular technology's benefit comes from 20 percent of its features. I liken this to my use of Microsoft's Word software; I'm confident that I know how to create new documents, type content and save them, but I realise that this is possibly my limit. People who use the software daily, on the other hand, are likely to have developed a much deeper understanding of its full functionality, such as the ability to create tables and graphics, mailings and links for example.

However, effective pedagogical use of technology isn't simply about learning the functionality. Of course, knowing all the features to create dynamic visual learning opportunities provides a step towards good teaching, but I have seen so many teachers who have had in-depth training, standing at the front of the class and using the full functionality of an interactive whiteboard, yet still presenting to 30 children who are totally disengaged.

There is a difference between simply having the technology and embedding that technology into the teaching pedagogy. The latter means engaging the students in their learning: getting them up to the front of the class, debating their actions with their peers, and discussing alternatives. In this situation the teacher should be walking around the class as the catalyst for learning.

The best way for educators to understand new technologies and how to use them for excellent teaching and learning is to share experiences with their colleagues, but this is very much time dependant, which brings me on to my next point...

It's about time

Headteachers today have become business managers with budgets to balance, marketing requirements to attract pupils, and Academy Trusts to join.

At the same time, teachers are crowded by demands for assessments, reports, data input and of course marking, to the extent where they often seem to have no space for 'real' teaching. With less room for manoeuvre, I actually see the adoption of technology getting rather slower.

"Designing truly personalised learning for each child has been virtually impossible..."

At Learning by Questions, which I set up to help schools use technology to save themselves time, I meet teachers struggling to find opportunities to implement the very technology they know will make their working day more effective and their teaching more impactful.

Private schools are possibly able to achieve better results purely because they have more teachers teaching fewer students, with potentially fewer compliance boxes to tick; quite simply, they have more time to teach. So, what can teachers do to give themselves more time to focus on the learning?

Student centred

The first thing to remember is that the biggest underutilised resource in education is the students themselves. Thankfully, today's technology innovation has brought a new level of intelligence to software, which puts the child back at the centre of his or her own learning. Systems can set questions for students to investigate and solve. Depending on their response, the system 'recognises' if they have got it right or wrong, and is able to provide them with clues to learn from and another question to give them a second chance; because after all, deep learning happens as a result of making mistakes. For a teacher with a class of 30 students, designing truly personalised learning for each child has historically been virtually impossible, but today, technology is starting to truly enable this.

With Learning by Questions, a class of learners can be working on the same area of the curriculum but each at their own level of development. If necessary, the system flags to the teacher when a student is struggling and lets them see in real time what errors the young person is making, so they can intervene appropriately and immediately without the need to mark.

Technology isn't yet at the stage where it can work out *why* the student got the question wrong, therefore teachers are still a central part of each child's learning. However, while the students are completely engaged with their own, virtually autonomous learning, the teacher is free to 'teach' and support individuals as needed.

My privileged position has allowed me to see the mistakes that have been made over the past few years, and hopefully demonstrate the direction that I feel schools need to take. As a charity, we a keen for others to follow us; indeed I call on all technology developers to consider the data burden on teachers and the need to give them the space to teach.

ABOUT THE AUTHOR

Tony Cann will be on the Learning by Questions stand F160 throughout the Bett Show, and will be inviting an interactive discussion during his presentation in the Bett Arena on January 24, at 16:30. Entrance is free of charge, but pre-registration is recommended at www.bettshow.com.

Your Bett SURVIVAL GUIDE

Whether it's your first time or you're a veteran visitor, these top tips from fellow attendees could help you get the most out of this year's show...

Stella McCarthy, computing coordinator, year group leader and classroom teacher

"If you are attending Bett for the first time then here are a few tips:

1. Register in advance and print your badge – this saves time joining a queue to print it.

2. Check out the schedule of events on the Bett website and make a note of any sessions you wish to attend (again, valuable minutes saved).

3. If you are seriously looking for hardware and software, think about which stands you need to attend and head for those first. You can then relax and look for other amazing, fun creative technology; which you will no doubt add to your wish list...

4. Wear comfortable shoes and your fitbit; you will tot up thousands of steps!

5. Take a bag with you but only collect leaflets etc. on tech which you are definitely interested in; they seem to get very heavy by the end of the day...

But most of all, enjoy the event, and gather amazing ideas!"

Karine George, retired headteacher

"Preparation is key; come to Bett being very clear on what you want to look at. Download the brochure (with a map) and have a list of questions to ask. This means having done your research before attending, which includes talking to other schools: ask them questions about what went well with the technology, what didn't go so well. You can then use your time as effectively as possible, going to specific stalls armed with questions.

Be very clear on who is going and why. Who among your staff wants to go? And what is their reason for attending? What are their specific asks? As a head I usually went with a colleague who would be leading on the technology we were interested in. We went knowing what our budget was, having planned companies to visit and speeches to see, coordinating our use of time.

Make sure you give yourself headspace after the event to sit and think about the takeaways from Bett. You need to do this before you get back into the swing of school – you won't have time on Monday! Make the time to come up with the key action points to share with school leaders."

Jon Tait, deputy head

"1. LOOK AFTER YOUR FEET

If you've never been to Bett before, you won't appreciate how big it really is. Forget trying to look fancy in your new heels or brogues, look after your feet by wearing something comfy. You'll end up walking miles and miles around all the trade stands, demonstrations and exhibition halls. Ask yourself this question: would you go out for a 3-mile walk in your dress shoes? No? Then don't do it to yourself at Bett.

2. BE POWER SAVVY

If you're anything like me, you'll be tweeting, taking pics and running down your phone battery pretty quickly. Make sure you take a portable charge block with you, so that you don't run out of power. One of the great features of Bett is the ability to share in the thoughts of people there by following hashtags and conversations online. Don't end up being out of the game by lunchtime because you're out of power.

3. NETWORK, NETWORK, NETWORK...

If you've got a pretty active professional social media profile, you'll probably be 'friends' with lots of like minded teachers around the country whom you've never met in person. Bett is the ideal opportunity to catch up in person. Make a point of meeting up with people even if it's just to say hi and put a real face to a name. Post about the fact you're attending Bett and that you'd love to meet up with people for a chat about what they're doing in their schools – you might just pick up some golden nuggets or a lasting professional relationship along the way."

EDU Q&A

It's time to invest in resources that work

Anthony Coxon, founder of GCSEPod, shares his 2019 edtech predictions...

TS What do you see as the main edtech trends for the next 12 months?

AC Artificial Intelligence (AI) and Augmented Reality (AR) continue to be the exciting new additions to the edtech range of resources. While GCSEPod is an advocate of the power of visualisation in learning, and AR brings a new visual experience to the classroom, it will be interesting to see if there is any measured additional impact of AR and AI on attainment. With tight budgets, schools will be looking for technologies that are trusted and proven to support their specific needs: streamlining the workload for teachers, providing them with automated and instant data and analytics, and driving outcomes in learning. Due to educators often having to wear more than one hat and teach outside their specialism, it is also becoming ever more important to build confidence within the faculty and give teachers the tools they need to carry out these duties with confidence and be assured the content is there with a minimal drain on their time.

And what do you think will be the main edtech challenges in 2018?

There is nothing more frightening at the moment than the very real horror story of funding in education. And this is exactly where edtech rides in on its white horse....

There are bold claims that there's more money in the system than ever before but equally, there are now more pupils than ever before; 8.5 million and growing by 100K per year. The National Funding Formula (NFF) is a significant improvement on the previous system, but the overall level of funding to schools is still too low. After the NFF was announced, the reality became clear, that per pupil funding across the board will fall 4.6 per cent by 2020.

Surely, then, this isn't the time to be investing in edtech?

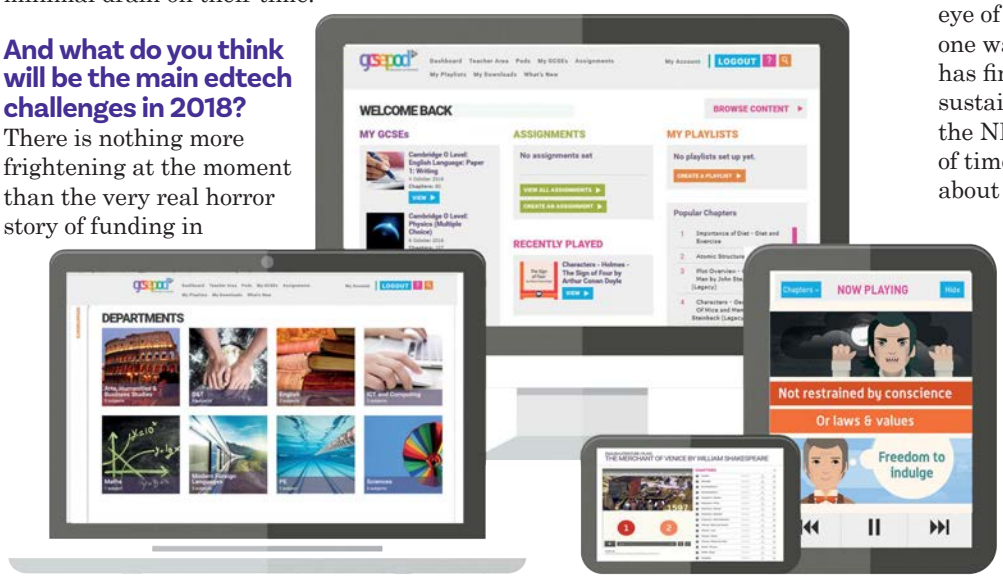
Actually, for informed senior leadership teams, quite the opposite is true. They recognise that for maximum impact, with modest outlay, embedding the right technologies with supporting content within the teaching framework might very well save the day; bringing positivity, reducing workload and workplace stress. Edtech has been shown to reduce teachers' work load, and in turn, assist with mental health and wellbeing. The knock-on effect is demonstrated through reduced absence as well as addressing the industry's larger retention and recruitment bête noir. If technology does address these issues, resulting in staff being more motivated, then the financial burden of the ever-present cost of recruitment could be minimised; releasing funds for other products that work hard for all, for pupils, teachers and the whole school.

So you don't think technology is set to replace teachers?

Absolutely not! Edtech is not there to take over, but to be an aid. Here at GCSEPod we do not seek to replace the teacher, but aim to capture the enthusiasm, knowledge and experience of teachers and continue to provide that to students after they've left the school gates.

How does the long-term future of edtech look to you right now?

Having been in the sector for over 10 years (from before when 'edtech' was a thing), my view is that we are in the eye of the storm, where there is only one way to go: out. The government has finally realised that it is no longer sustainable to continue to under-fund the NHS – surely it is only a matter of time before it concludes the same about education, allowing teachers to make the right decisions to invest in resources that work.



To find out more, visit www.gcsepod.com

ScreenBeam™

Boost productivity with Wireless Presentation and Collaboration

ScreenBeam Solutions make it easy to connect and present BYOD content on the large screen, and collaborate with touch display support'

Untether teachers

Eliminate "sage on the stage" teaching and be a "guide on the side" for better student engagement. Be "present" vs "presenting" in your classroom.

Support wireless touch

Teacher annotations on touch displays are instantly captured and saved on the presenter's screen, even when not touched-enabled.

Extended desktop

Deploy ScreenBeam in extended mode (Windows 10/8.1 only) and use device for other actions such as web browsing or chat even while presenting.

Utilize proximity control

With mobility it's easy to observe students, identify issues faster and help off-task students refocus, without interrupting instruction.

Create flexible classrooms

Teachers can optimize classroom layout to achieve a more fun and collaborative environment. Eliminate only desks in a row..

For more information, call: **020 7424 6960** or email: **sales@joskos.com**

Superior Wireless Display

ScreenBeam™ wireless display

Joskos Empowering Education through Technology

Thanks to these innovations from ScreenBeam, you can take classroom presentation to a whole new level...

SCREENBEAM 960

Now you can modernise all your meeting spaces and classrooms with a wireless display receiver that supports native screen mirroring, extended desktop and interactive touch displays.

ScreenBeam 960 enterprise-grade wireless display receiver enables native screen mirroring from your Windows, Android and Apple devices — without apps or wires.

Designed for large scale deployments, ScreenBeam 960 makes it easy to connect your mobile device to the room display with a single click or swipe. Extended desktop maintains device use for other actions while presenting, and support for interactive touch displays and wireless touch brings collaboration to the front-of-room display. Central Management System (CMS) software is included for remote management of receivers, providing enterprise-class security and manageability that IT departments need.

- Native wireless screen mirroring means no apps or wires
- Collaborate wirelessly with interactive touch screen support
- Share any form of content, videos, images, slides
- Extended screen maintains use of device for other actions
- Multiport connectivity and world class audio
- Designed for commercial applications and dense wireless environments
- Centralised IT management saves resources and budget
- Minimal training required, simple to use
- Connects to displays, projectors, control systems and Skype Room systems via HDMI and USB

SCREENBEAM CLASSROOM COMMANDER

ScreenBeam Classroom Commander is an easy-to-use wireless orchestration system for Windows 10 classrooms that also delivers wireless display capabilities.

The technology combines wireless display with student device orchestration to improve lesson flow and collaboration. Teachers are untethered from the classroom display to create an agile learning environment; they can move freely and interact with students without interrupting instruction. Constructive feedback is made easy with support of Windows Ink and touch displays. Now teachers can annotate directly onto a student screen from the classroom display—even when student devices are not natively touch-enabled.

- Preview student screen before sharing on classroom display
- Monitor student screens and active applications in real-time
- Collaborate wirelessly with wireless inking and touch display
- Create flexible classrooms and eliminate “desks in a row” formation
- Launch browsers to designated URLs across individual, group or all devices
- Command attention by blanking student screens and locking keyboards
- Create a private in-room network for wireless connectivity
- Provide a dedicated P2P connection between each device and display

For further information, call: 020 7424 6960 or email: sales@joskos.com

"I know how to do this!"

The secret of running a successful STEM club is creating an atmosphere where it's ok to fail, says **Lynn Nickerson**

Jessica clutched her 2-litre bottle of diet cola carefully. She'd just created a series of holes around the top of it; and the next step was to thread a string of Mentos through a hole in the lid, then go outside, screw it on and release the string. The other students were gathering their kit and we were all about to head outdoors when a squeal and a whooshing noise alerted us to the awesome sight of a fountain of cola reaching the ceiling while Jess tried frantically to cover the holes with her fingers and carry the eruption towards the door. Intervention was hopeless. After 30 seconds it was all over. Wiping away the tears of laughter, we all joined in the clean-up.

After ten years the mark is still there on the ceiling to remind me of the funniest thing that has happened at

"A typical activity will involve every student getting hands on"

Science Club. Jess is now a laboratory analyst and I have learned not to issue any Mentos until all bottles of cola have their tops firmly screwed on.

Lightbulb moments

Didcot Girls' School Science Club began 20 years ago when a keen chemistry teacher set up a lunchtime club so girls could get more hands on experience with practical science. When she left I didn't want to see the club fold, so I volunteered to run it, and since then it has grown from the preserve of a few Year 7 science aficionados to two after school clubs (lunchtimes are shorter now) to cater for all ages. At first I stuck to running activities already designed for science clubs but as I became more experienced I got more creative and began to invent or adapt ideas to provide an hour of STEM fun for a group of 30, 40 (or on a few especially memorable occasions 60) girls.

I want to encourage practical skills, problem solving and to cultivate an atmosphere where it is OK to fail. The important thing is for a girl to figure out what went wrong and why, then have another go and improve. A typical activity will have the minimum of written instructions, not require any writing and involve every student getting hands on. For

younger girls, chemistry activities often involve fire, Bunsen burners, colour changes, fizzing, bangs and pops. Competitions are always popular, as are detective scenarios. Last week the head of science popped in, cup of tea in hand, to see what we were doing. Little did he know that 40 girls were analysing the rate of cooling of cups of tea to determine which of four suspects had left their hot beverage at exactly 65°C next to the "body of a murdered teacher". His name promptly shot up to the top of the list!

Senior Science Club is for year 9+. It tends to attract a smaller but no less enthusiastic clientele. This is where I often work with the girls to test ideas – we might try out an experiment we've read about or seen on YouTube. Once we decided to make our own paint – not by mixing existing colours but by creating the coloured pigments by chemical reactions. How much of each reactant did we need to mix together to make lead iodide, a beautiful yellow solid? I'll never forget the light bulb moment when Tessa exclaimed "I know how to do this!" Her lessons on balancing equations and mole calculations suddenly came to life and she started scribbling down figures and then triumphantly and correctly announced how much of each we needed.

Amazing opportunities

As a scientist I love sharing investigations and experiments with students. Over the years they have earned CREST Awards, won local and national competitions and been on countless visits to local universities and STEM companies, all of which I have probably enjoyed as much as the girls. However Science Club has also given me opportunities to try some amazing things that you might not normally associate with STEM. I never expected to be the producer of two short films with a professional director and crew, to help girls create a chemistry quilt from sheep's wool, showcase a play we'd written at Earl's Court, meet Tim Peake or to take students to the House of Lords to receive the STEM Inspiration Award for the outstanding STEM Club in the UK.

Awards and recognition provide special moments but it is the satisfaction of working with the girls week after week to have fun in the science lab without any success criteria or learning outcomes that makes running Science Club worthwhile. My proudest achievement is that a former student, who came to Science Club for her whole seven years at Didcot Girls' School, not only went on to study science at university but then became a science teacher and is now running her own Science Club. The future is in safe hands.

HOW TO MAKE SURE YOUR STEM CLUB IS TOTALLY BRILLIANT

START SIMPLE
Base your initial sessions on tried and tested activities. Once the students are hooked you can get more adventurous. When you are ready, try some activities where you don't know the outcome. Now you are doing real science and you and the kids can experience the thrill of making your own discoveries.

TEAMWORK
Don't try to do everything yourself or running the club can become a burden. Involve technicians, colleagues, parents, older students or STEM Ambassadors. Never do anything a student can do – they can take a register, carry equipment, write on the board and clear up. It should become their club – not just yours.

ENTHUSIASM
Your enthusiasm will rub off on the students, so be ready to join in with the activities, get to know the kids and enjoy STEM together.

MISHAPS
If something goes wrong or doesn't work, help the students to work out why and then have another go – that's what scientists and engineers do. Always have some spare supplies handy. They will make more mess than you think, spill things and use up all of whatever you put out. Always do a risk assessment. Then get hands on and have fun!

ABOUT THE AUTHOR
Lynn Nickerson DPhil, is STEM coordinator and science inclusion mentor at Didcot Girls' School.

Training GROUNDS

Truly exceptional STEM teachers need access to high quality, subject specific CPD says **Frances Dainty** - so how can we make that happen?

Question: What is the solution to the following key challenges?
+ Providing a world leading STEM education for ALL young people.
+ Inspiring the next generation of highly skilled, expert scientists, engineers, computer programmers and mathematicians.
+ Retaining, highly knowledgeable, confident and effective teachers of STEM subjects in all our classrooms.

Answer: The sustained provision of high quality, impactful, subject specific CPD for all teachers of STEM subjects at every stage of their career.

There is only one answer. We know that a highly knowledgeable, confident, expert teacher with a command of their subject has an enormous impact on the achievement, aspirations and life chances of young people in every classroom. Investment in ensuring all teachers of STEM subjects can be the best that they can be for themselves and their students is vital. After all, we wouldn't expect anything less in other professions. We wouldn't accept a surgeon operating on us or a family member if they hadn't had recent, high quality training; so why is it any different for teachers and young people when it comes to continuing professional development?

Something for everyone

Happily, CPD for teachers of STEM subjects comes in a variety of shapes, sizes and modes; there is something for everyone at every stage of their professional learning journey, whether a PGCE student, head of department or SLT. The how, when and what can be anything from intensive face-to-face, local, online, placements in industry, STEM Ambassador support, quality assured resources, coaching… whatever best suits current and emerging needs. Making it count is important, so an essential element is the action planning support to enable immediate, short and long term impact in the classroom. The most effective CPD does this absolutely relentlessly.

Specific CPD for STEM teachers is vital in ensuring subject knowledge is accurate, up to date, and underpinned by current research. A recent study commissioned by the Wellcome Trust, 2017 and carried out by Education Datalab, found that science teachers participating in CPD courses at STEM Learning are 160% more likely to remain in teaching compared to teachers who did not receive CPD. At a time when we have a severe shortage in science teachers in England, with six out of ten newly qualified teachers leaving in the first five years, valuing the teaching profession and investing in CPD has never been so important.

Opening doors

Engineering can be used as an engaging context to teaching in any STEM subject. However, many teachers have limited first-hand experience of engineering and as a result, often lack the confidence and experience needed to bring the subject to life and make changes to what is already a full curriculum. Attending face to face CPD, whether at the National STEM Learning Centre or with one of our partner engineering employers, provides teachers with the experience of engineering and supports them to adapt their curriculum content, strengthening the link to engineering and engineering careers later on.

Arming STEM teachers with the knowledge and experience to be able to link their curriculum learning to future study routes and career possibilities for learners is crucial. CPD, both online and face to face,

THEIR OWN WORDS: WHAT DOES CPD MEAN TO TEACHERS OF STEM SUBJECTS?

"I feel 100% more confident in using effective strategies to manage difficult situations that can arise, as well as finding ways to implement new school or department policies within my team. It has really allowed my confidence as a leader to show, as I am aware and can manage the main job roles of a HoD, which has also instilled a new confidence in my colleagues."
MATHS TEACHER

"Great experience and fantastic opportunity to update my subject knowledge on immunology which I can use to update my lesson resources. On reflection, I can say that this experience has been one of the best of my professional life!"
FE TEACHER – BABRAHAM PLACEMENT

"I felt that it was eye opening in terms of getting me to think about what kind of teacher I would like to be."
NQT, NQT SUMMER SCHOOL

"I attended the New and Aspiring Heads of Science course last year and wanted to say a big thank you for all your help and support. I was successful in securing a Head of Science role in my current school today; all of the wisdom on the fantastically designed course contributed enormously to this outcome."
COURSE PARTICIPANT

can strengthen teachers' knowledge of the various study routes open to students leaving their classroom (university, T levels, apprenticeships). CPD enables teachers to confidently and accurately signpost pupils to the many opportunities available for pursuing STEM careers and further study, as well as helping them raise aspirations for young people who need it the most.

Professional networking

For the large number of D&T and computing teachers who may be lone subject specialists in their school, or working within very small teams, attending face to face CPD not only gives them the opportunity to develop subject knowledge and skills but also provides the opportunity to network with specialist colleagues outside of their own establishment. For example, for many educators the publication of the new D&T GCSE content has raised more questions than answers. Face to face CPD enables these teachers to develop understanding of the new qualifications and plan a robust curriculum that will provide students with the skills and knowledge progression needed to address the GCSE challenges that lie ahead of them.

The immense benefit of CPD that brings teachers from STEM subjects together to reflect upon the specific requirements of teaching those disciplines, and how the context from one subject can bring to life another, can really be exemplified in what teachers have told us about the impact of their participation in online CPD in particular.

"I am a physics trainee who has been teaching biology. Seeing the practical aspects of this subject and exploring the comments and activities suggested by this learning community has been superb."

Secondary science teacher, Teaching Practical Science MOOC: Biology

"The course gave me an opportunity, since I am in a single teacher department, to interact with other teachers and to learn from their experience... This certainly helped in my professional development."

Secondary science teacher, Teaching Practical Science: Physics

ABOUT THE AUTHOR
Frances Dainty is head of content and STEM expertise at STEM Learning. Find out more about the organisation's CPD offer at stem.org.uk/cpd

How can we revive creativity in our CLASSROOMS?

STEM education is vital for our nation's future – but not without the arts, too, insists **Marcus-Alexander Neil**

Anyone with their finger on the pulse will be aware of the current shift in schools' focus away from 'creative' subjects such as art, design and music, in favour of core options like maths, science and English. In fact, the continued focus on performance tables and the impact of cuts on school funding mean that overall, maths and science make up more than half of lesson time for 14-16-year olds. Many schools are struggling to teach a wide curriculum – a recent BBC survey revealed nine in every 10 schools are cutting back on lesson time, staff or facilities in at least one creative arts subject. Ofsted has recently acknowledged the situation, with Chief Inspector Amanda Spielman saying schools have 'lost sight of those things that are harder to measure'. And to compound the challenge, schools are being pressured to ensure 90% of students sit the English Baccalaureate (EBacc), which excludes any arts subjects, by 2025.

Shell has been supporting STEM education for over 50 years, because having access to a healthy pipeline of scientists and engineers is critical to businesses throughout the sector, and for tackling the big energy challenges of the future. There's a well documented predicted shortfall of 59,000 engineering graduates and technicians on the horizon; so surely, a laser focus on core STEM subjects in schools is good news for an industry looking to inspire and support the future generation of engineers and scientists?

"Creative subjects help students develop tactile skills, and become innovators"

The tactile gap

In reality, though, not prioritising creative learning and subjects could have a negative impact on students' ability to succeed in STEM related roles now and in the future. Alice Barnard, chief executive of the education charity the Edge Foundation, says that our current approach to education is 'not fit for purpose to tackle a 21st century economy'. It's not just employers from the creative industries expressing concern about the impact it's likely to have on the talent pipeline, but those across all industries.

Creative subjects help students develop tactile skills, enabling them to work comfortably with their hands and become creative 'digital makers' and potentially innovators of the future. 'Tactile general knowledge' can be achieved through less of a focus on exam results and a shift to

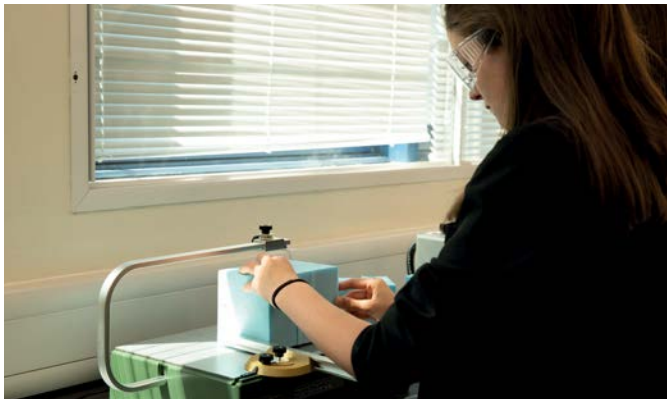
creative learning, as well as practical activities which bring ideas to life by sketching, designing and building. Robert Kneebone, professor of surgical education at Imperial College London, has warned about the loss of medical and science skills amongst students, including the ability to manipulate laboratory tools such as a pipette, commonly used in chemistry, biology and medicine. He cites an example of "a surgeon needing some dexterity and skill in sewing or stitching". As schools teach the core subjects theoretically rather than practically, students may be achieving high exam grades but still lack 'tactile general knowledge' and struggle even to conduct chemistry experiments.

More generally, art and design subjects also provide students with an opportunity to apply creative problem-solving skills in a variety of situations, providing them with a more rounded approach to learning in STEM subjects now and, eventually, in the workplace. Finding solutions to the big challenges faced by the world today will require holistic thinking and people who can collaborate across subject silos; providing students with an opportunity to become fluent across specialisms will better equip them for collaborative workplaces of the future.

Real challenges

So how can businesses provide teachers and students with opportunities to apply practical skills and creativity in a way that fits within the highly pressurised, core subject focused system? One way is by integrating practical and real-world skill development into these subjects through resources that link to the curriculum, making it easy for teachers to build creative learning into their STEM lessons.

The Bright Ideas Challenge, Shell's cross-curricular schools' competition, invites secondary students aged 11-14 across Great Britain to imagine creative ideas to power cities of the future, ensuring they are healthy, vibrant and clean places to live. As part of the competition, winning teams get to take their theoretical ideas and learning to a practical level, through an exciting prototyping session at Imperial College London's Reach Out Makerspace. With the help of professional design engineers, students apply their STEM and creative skills to build their idea into physical mock-ups. This process requires innovative thinking and artistic skills, as well as adept problem-solving techniques. This model is then used as the basis to design a CAD image, which is 3D printed and submitted to the judging panel – a process that replicates the work of real, cutting-edge engineers like Dyson.



The decline in creative subjects being taught in schools, paired with the challenges presented by EngineeringUK's predicted shortfall of engineering graduates and technicians, means we need to think creatively to ensure students are leaving school with the 'tactile general knowledge' they need. This is key to succeeding in a range of professions, from the creative industries to science, medicine and engineering. By building practical skills within an exciting and hands-on environment, students will be prepared to excel in the 21st century workplace.

HANDS-ON DESIGN TIPS

Translate the design prototyping process into classroom activities across the curriculum, to get students thinking outside of the box:

1. HOW COULD THE ITEM BE MADE BETTER?
Most design ideas are adapted from existing ideas, so this stage involves thinking about how things can be improved to be more efficient.

2. CAN THEY DRAW IT?
Before they start building the product and are still in the ideas stage, designers sketch their ideas on paper to present and communicate the design to others.

3. TRIED AND TESTED?
In this stage of the design process, product testing takes place.

4. BUILDING MODELS
Many big companies still begin their prototyping process using cardboard models, as it's cost-effective and can be better than 3D drawings at showing how a product or product part will work and look.

5. DESIGN SPECIFICATION
Now a design specification is needed. Several factors must be considered, for example, durability, hygiene, speed, size, maintenance and environmental standards.

6. TRIAL AND ERROR
This stage is a slow but steady process of making improvements, one change at a time.

7. PROTOTYPES
In this stage thousands of prototypes are made. As well as making cardboard models, engineers use a prototyping technique called Selective Laser Sintering. The engineers' drawings are sent to a 3D printer, which fuses nylon powder layer by layer into a fully working part.

8. TESTING
In this stage prototypes are tested against the specification for hygiene, efficiency, durability, speed and noise levels.

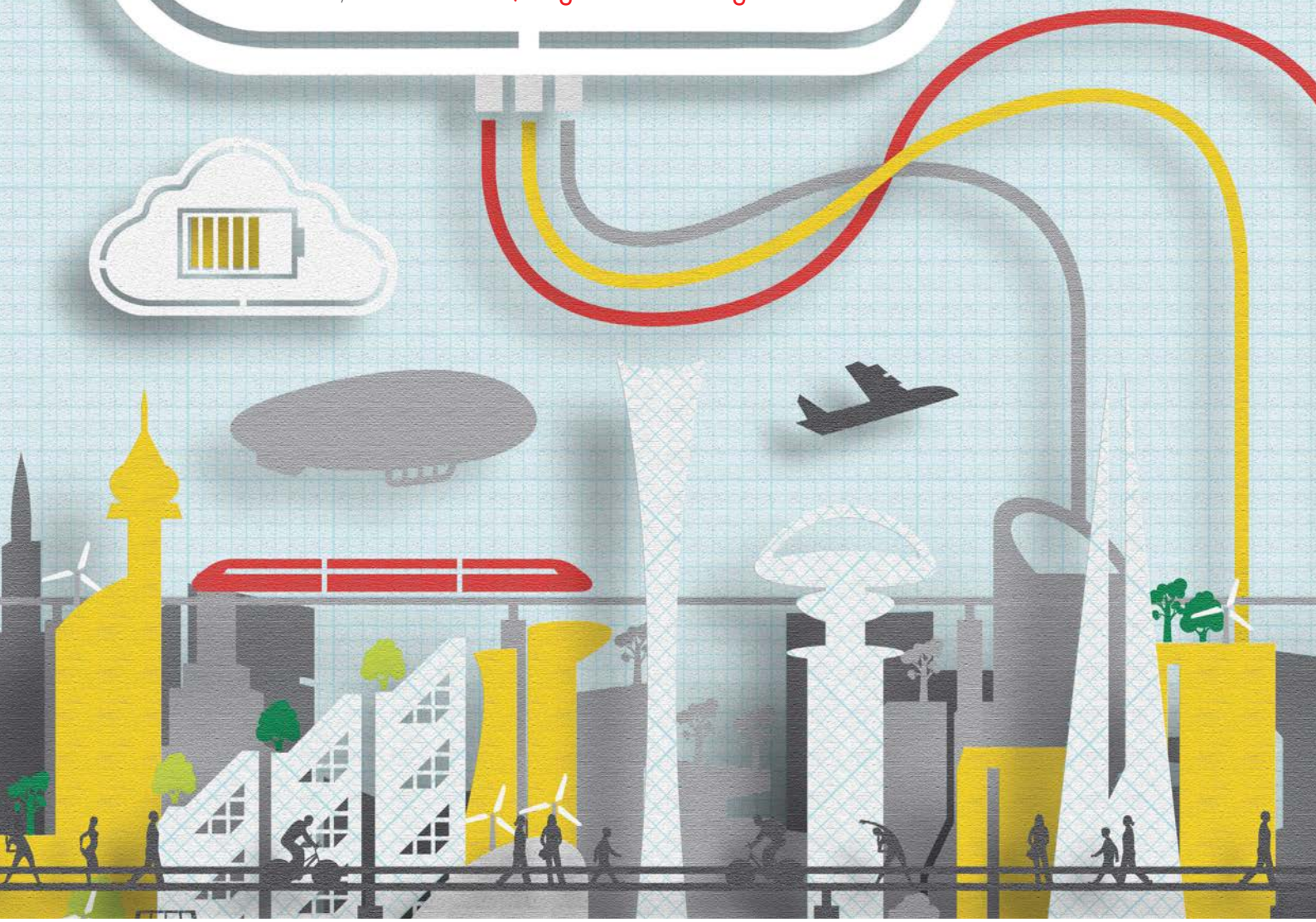
9. FINAL PRODUCT
The final product is manufactured and sold.

ABOUT THE AUTHOR
Marcus-Alexander Neil is UK Education Lead at Shell

THE BRIGHT IDEAS CHALLENGE

What will cities look like in 2050 – how will they be powered to be vibrant, healthy and clean places for people to live?

We're looking for students' bright ideas to power future cities. To find out more, including how your school could win up to £5,000 and a funded VIP STEM experience in London, visit shell.co.uk/brightideaschallenge



Teacher information

At Shell we're committed to inspiring the next generation of scientists and engineers. That's why we run The Bright Ideas Challenge – our cross-curricular schools' competition. It invites secondary students across Great Britain, aged 11-14, to imagine creative solutions to power cities of the future. We've developed a suite of resources to support your teaching and spark students' imaginations, including a Resource Navigation Guide, step-by-step Teacher Toolkit, Student Workbook, mini videos and more. You can download the resources and find out more about the prizes online. Full terms and conditions apply. See shell.co.uk/brightideaschallenge

Why I Love...

Teacher Sam Westaway explains how taking part in The Bright Ideas Challenge has boosted STEM learning at Atrium School...

It's real world learning

The competition supports real world learning by getting students to think outside of the box and imagine ways to power cities of the future. It helps inspire them to think about how science, engineering and creativity can be used to make a real difference to the world and gets them excited about career possibilities for the future. At Atrium we use project-based learning to link our lessons with the real world, so the competition sits perfectly within that. The competition inspires a drive for students to go above and beyond with their entry. There is no ceiling for how far they can go with the project.

It's completely free

The resources are all free and a fantastic starting point to launch the competition with students. They include a step-by-step Teacher Toolkit, Student Workbook and a Classroom Presentation centred around four videos, to help guide them through the competition process. These are easy and inspiring to deliver and have been carefully aligned to the curriculum. It's also truly cross-curricular. When we're delivering the competition at Atrium, we look at it as part of sustainable energy in science, data collection, energy and scale in maths and design in Design Engineer Construct (DEC).

It develops soft skills

As part of the competition, students work in teams of up to five. This emulates the workplace and encourages them to think about their individual skills and interests and how they sit within the team. It offers students a fantastic opportunity to develop problem-solving and communication skills working with their peers. I've witnessed pupils taking on leadership roles undirected, providing support to other team members whilst also stretching themselves. It's great to see students showing this kind of leadership potential, as well as other skills that prepare them for the workplace such as collaboration, communication and problem-solving.

It supports creative thinking

As part of their entry, students are asked to come up with something innovative and consider how it will work in practice. Initially they write their ideas up into an entry form and must think clearly and concisely to ensure their idea fits within the word limit. Our team's winning idea was 'Energy Walk Ways' which would see blocks made of piezoelectric crystals installed into high footfall areas across future cities. These blocks would convert the kinetic energy created by pressure and movement on a mass scale into electrical energy, generating this would contribute power to surrounding buildings. The competition also encourages them to think about supporting materials to accompany the proposal such as CAD, video presentations and physical prototypes.

The prizes are amazing!

As well as inspiring younger students, the winning team took part in a unique STEM experience where they got to see what other technologies are on offer and meet other contestants. As a small school, to have an injection of cash is positive for everyone's learning. With the prize money, we've managed to purchase new hands-on equipment like pillar drills as well as items to enhance future projects of the future such as 3D pens and hand controllers for state of the art VR, so students can interact with the buildings designs they're doing. Despite the fact that Atrium is a design and build school made up of 90% boys, the winning teams have all been girls.

Sam Westaway is a teacher at Atrium School, a studio school for students in Years 9-13 specialising in the built environment. In 2018, a team from Atrium was named regional winner in Shell's Bright Ideas Challenge.

To find out more visit shell.co.uk/brightideaschallenge today to start inspiring your students about the role they could play in shaping a better world through science, engineering and creativity.

THE BRIGHT IDEAS CHALLENGE

Are you teaching the FIRST MARTIAN?

When it comes to getting students excited about STEM subjects, what could be more enticing than the prospect of real-life space exploration, asks **Colin Stuart**

The first person to walk on Mars is already alive. When Neil Armstrong left historic footprints on the Moon in 1969 he was thirty-eight years old. Space scientists around the globe are gearing up for a Mars-shot and it could well happen in the next two to three decades. That means the world's first Martian is currently at school. Today's pupils are tomorrow's history makers. Right now teachers have a unique opportunity to inspire the next generation of scientists and engineers with the tantalising prospect of this human mission to the Red Planet.

To achieve such an audacious feat, humanity will have to bring together all our knowledge from across the sciences and overcome some big challenges, from how to shield astronauts from harmful radiation to supplying oxygen and food to sustain them. It's a chance for teachers to present science not as an abstract collection of facts, but as a living, breathing entity capable of delivering historic human feats that our ancestors could only have dreamt of. And not as a group of isolated subjects, but as a true interdisciplinary endeavour. Physics, chemistry, biology, engineering, computing, medicine, materials science, psychology and mathematics just some of the fields tangled up together in the science of human spaceflight.

New challenges

Innovative work is already underway to tackle some of these challenges head-on. Engineers are experimenting with ways to 3D print flat-pack habitats out of local materials, and developing AI and robotics technology to help us explore Mars safely. Botanists are growing plants using simulated Martian dirt to see what thrives. Psychologists are conducting experiments to see what true isolation does to the human psyche. Materials scientists are looking at how to improve the next generation of spacesuits. Scaled-down versions of many of these efforts can be brought into the classroom to show science in action. British astronaut Tim Peake's most recent book, which I worked on with him, contains many puzzles and group exercises perfect for developing teamwork and problem solving skills, all set in science context.

Making the most of this opportunity to inspire is vital to our success in the decades to come. Today's pupils lack the lure into space sciences that the Apollo missions

spearheaded a generation or two ago. We need to make the most of this Mars-shot to galvanise them, securing our future in space. As an added bonus, studies have shown that students initially attracted into STEM subjects by space move on to have successes in other areas of science too. It's just one example of the kick-backs we get from pure, 'blue skies' scientific research. By setting ourselves the biggest challenges and attempting to the answer the grandest of questions we are forced to think outside the box, leading to unusual solutions to problems we didn't even know we had. There are countless examples of curiosity driven research resulting in great strides forward in our everyday lives, from the World Wide Web to wireless communications and medical diagnostic tools. A Mars-shot will surely do this too, and then some.

Deep debate

But we should be honest, too, about the potential drawbacks this ambition might bring. Why go to Mars in the first place? Shouldn't we wait to make sure there is definitely no life already there before we invade and spread our germs everywhere? We could wipe out evidence of what would arguably be the biggest discovery in human history. Billionaires like Elon Musk and Jeff Bezos are also using the language of 'colonising' Mars. Doesn't this just repeat some of the least desirable traits from our pretty recent history? Why do we think we have the right to walk all over the solar system?

While there are international laws surrounding our exploration of space, they've hardly been updated since the 1960s. With the space sector set to explode in the decades to come, new careers paths for today's students are emerging. Space lawyers will be increasingly required to make sense of it all. The proposed mining of asteroids and other space resources could make the need for them even more acute. So there's also a chance to also intrigue the pupils who are thinking about more traditional career paths.

Advocates of heading to Mars argue that we need to 'back up' humanity, just as we back up our computer files, by having a permanent human presence on another world. And they have a point. Threats to our continued existence as a species range from climate change and pandemics, to asteroid impacts and nuclear wars. Yet the fact we have a spare shouldn't give us free reign to continue to mess up the planet we already have. A frank discussion on the morality and ethics of technology can teach pupils that science is the sails of progress, but not the rudder. Where we go and how we do it is up to them. After all, it is they, not us, who will be going to Mars. Let's help them to do it right.

5 THINGS YOU MIGHT NOT KNOW ABOUT MARS

+ There are rocks on Mars called Yogi, Scooby Doo, Spongebob Squarepants, Barnacle Bill, Snow White and Ice Cream.

+ On Mars the daytime sky is red and sunsets are blue. This reversal of what we're used to on Earth is due to huge amounts of dust in the Martian atmosphere.

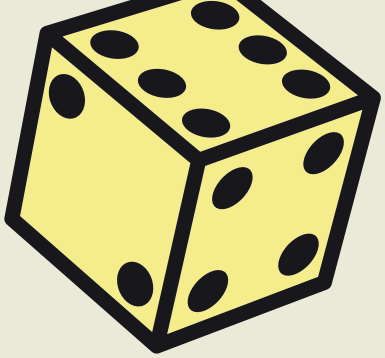
+ Mars's largest moon, Phobos, is smaller than London and whizzes around the planet so fast that it usually rises and set twice each day.

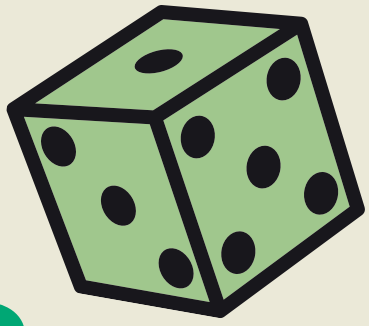
+ On 10 Nov 2084, any human on Mars will see the Earth and Moon move across the face of the Sun.

+ Back in 2013, NASA's Curiosity Rover hummed Happy Birthday to itself on the surface of Mars by vibrating some of its metal plates at the appropriate frequencies.

"Today's pupils are tomorrow's history makers"

ABOUT THE AUTHOR
Colin Stuart (@skyponderer) is an astronomy author and speaker, having written books including How to Live in Space. His talk for schools - How We'll Live on Mars - examines these issues. For more information visit www.colinstuart.net/mars





Problem SOLVED?

The maths department has often been overlooked by edtech developers, says **John McGowan** – but change is coming...

It's ironic, isn't it? While education technology is rapidly transforming teaching and learning, it sometimes seems that maths has been left behind in the rush.

Despite initial negative reactions from educators (and parents), pocket calculators were an essential piece of kit for every child by the 1980s, and mandated by many exam boards. Take a quick look at the modern classroom: it's not hard to see how technology has provided new ways for pupils to collaborate, apply critical thinking, problem-solve and be creative - the very skills that are prized in the modern workplace. There's no end of apps, programmes and websites focused on literacy, languages and history. But mathematics has stubbornly resisted many attempts to digitise classroom pedagogy. So what's going on?

A different language

I always like to think maths teachers were actually some of the first ever to start working with technology because of that really cool thing called a calculator. I've spent much of my time in North American and International schools both teaching and helping other educators effectively integrate technology into their lessons. And yet, from my own experience, the structure of today's maths class hasn't changed a whole lot, despite the massive strides technology has brought to other disciplines.

When Chromebooks and iPads started coming into classrooms, I thought they were really cool. I could see all the applications for English or history, but we always got stuck on how to bring this technology into mathematics lessons. And that's because when it comes to maths as a subject, we're dealing with a whole different language.

Originally designed primarily for text entry, a keyboard and mouse isn't the most intuitive way to input something as simple as fractions or long division, never mind the solution to a quadratic equation or basic algebra. As a result, the whiteboard – plus good old pen and paper – have remained the default choices for teachers and pupils to scribble formulae, graphs and other necessary maths expressions.

Educators hardly need reminding that technology plays a central role in boosting pupil/teacher engagement and more importantly, in deepening learning. So surely it's time to reassess its value in developing problem-solving and thinking skills across mathematics and other STEM subjects?

Multiple advantages

One of technology's biggest benefits is its ability to provide pupils with an array of options for expressing and articulating their learning. Whether it's fun new ways to visualise a function, or the ability to kick ideas back and forth in a shared virtual workspace, technology gives students the freedom to build mathematical language and vocabulary, and be empowered on their own learning journey like never before.

Perhaps more than in any other subject, insight into

"Insight into mathematical concepts comes to pupils in a series of penny-dropping moments"

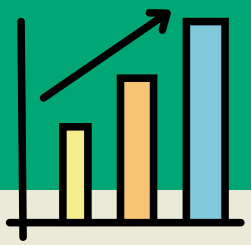
mathematical concepts comes to pupils in a series of penny-dropping moments. A fun interactive game or a simple diagram can make frustrating barriers to understanding vanish in a moment. Whether it's videos or animations, digital media can help bring virtually any mathematical concept to life in exciting new ways, which give context and meaning to learning. Indeed, there's strong evidence to support the notion that all pupils, regardless of their strengths or challenges, benefit from the visualisation of mathematical concepts and the ability to interact with them in real time.

Compared with traditional techniques, technology can give kids invaluable ownership of their own learning experience, letting them feel that they're the central player and not just a spectator in the classroom.

Moreover, digitising maths brings other big benefits for schools. Tech offers a huge leap forward for accessibility and inclusion, allowing learners with diverse needs to engage and interact with content in ways that are easier for them – whether it's a simple screen reader function or more flexible, comfortable ways to input and manipulate expressions.

THE ARGUMENTS, AT A GLANCE:

+ Technology can have a real impact on developing problem-solving and thinking skills for pupils across mathematics and other STEM subjects
+ Pupils need ownership of their own learning experience
+ Tech offers a huge leap forward for accessibility and inclusion and can facilitate penny-dropping moments for maths instruction



Today's pupils can speak into their computers and watch equations magically write themselves on screen – even if they don't yet fully understand what the visual notation looks like on the page. Likewise, predictive text allows them to start typing equations and see how it might look in its completed form, without having to laboriously memorise a formula and type it in every time using ALT key codes or hunting down buttons for symbols such as square root (√) or Pi (π).

Progress, together

Above all, though, it's possible that the most exciting avenue that tech opens up for teaching and learning mathematics is that of true collaboration. Working in a Google environment, for example, has changed the way we use documents, presentations and worksheets as organic, evolving entities.

Whilst understanding the theory behind mathematical formulae is still crucial, surely, the real focus now is shifting towards how pupils can take all the information that's readily available and apply it in meaningful ways that suit every individual's approach to learning. Many of these tools for change are already in our grasp, with more arriving all the time.

It's the real-world application of new technology to collaborate, share, and learn in the way that works best for pupils that holds so much promise. No matter what their needs and abilities might be – whether they're an English language learner or have another exceptionality that hinders their ability to learn in a traditional lecture-style model – there's a new opportunity. For example, when pupils are able to listen to a question read aloud it can help them with processing. That's going to be a game-changer for many students, who may think right now that maths is just a whole bunch of memorisation and steps that they've got to do in a certain order; when it's so much more than that.

Let's create a new love of learning maths; let's help students learn with context, and in ways they've never had access to before.

ABOUT THE AUTHOR
John McGowan is product manager at Texthelp, which launched its revolutionary digital maths software, EquatIO, in 2017.

EquatIO®

personalised learning for maths & STEM: **thanks to EquatIO** it's not rocket science!

Developed to offer teachers the opportunity to explore maths & STEM beyond the restrictions of the blackboard, and give students the freedom to articulate their own learning, EquatIO allows users to type, hand-write, or dictate maths digitally, with no tricky coding to master.

Whether working with G Suite, Microsoft Word, Canvas LMS, or classic paper and pencil, students can use EquatIO to engage with maths & STEM assignments and assessments in the way they prefer.

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MATHS

EquatIO

A stroke of genius for the maths classroom, by Texthelp

AT A GLANCE

- **A digital solution for writing maths equations, formulas and quizzes**
- **Handwriting recognition and prediction features**
- **Maths-to-Speech for easy written maths**
- **Type maths directly within PDFs**
- **Planned around Universal Design for Learning principles**

REVIEWED BY JOHN DABELL

Writing maths expressions can be hard going, but trying to create them digitally has historically been tough, too. The technology isn't always the best at making this happen and things can get messy and frustrating; alas, tech-enabled classrooms don't always equate to improved accessibility.

I didn't think it was possible to simplify digital maths until I discovered EquatIO from Texthelp. This resource is something of a revelation because it helps you write equations and formulas on your computer without having to think like a programmer.

Instead, things have been made rather simple. All you need to do is type or handwrite any expression on your keyboard or touchscreen and the clever cogs and wheels behind EquatIO convert it into accurate digital maths. From here you can add it to Microsoft Word or G Suite with a simple click and the job's done, looking professional and businesslike.

It doesn't stop there either, because EquatIO adapts to the learner, instead of asking the learner to adapt to the information. Students might not be sure about what equation to use, but EquatIO can lend a helping hand by turning thoughts into on-screen formulas. And if that isn't remarkable enough it can actively listen, so that when students dictate a formula, it writes it out (it's smart enough to ignore non-maths words, and any ums, ers and ughs, too).

I don't think EquatIO is a replacement for pencil and paper working, but it's something to use as a very powerful complement because it makes maths far more engaging, dynamic and interactive. It encourages greater creativity and personal expression; students can add sketches, diagrams and annotations and easily share their work with teachers and their peers for increased collaboration.

EquatIO has obvious uses across the STEM landscape and I highly recommend its use to effectively meet the needs of a diverse group of learners in subjects across the curriculum. It's a masterpiece of technology, enabling mathematical literacy for everyone; it's also a BETT Awards 2019 finalist, and it is easy to see why.

TECHNOLOGY + INNOVATION

VERDICT

- ✔ **Promotes a deeper and more flexible learning experience**
- ✔ **Simplifies a tricky process and removes obstacles**
- ✔ **Perfect for thinking out loud**
- ✔ **Truly interactive and collaborative**
- ✔ **Gives all students an equal opportunity to succeed**
- ✔ **Active, expressive and engaging**

UPGRADE IF...

You are looking for a digital solution that will revolutionise the way you do maths. EquatIO is inspiring because it provides equitable access and removes barriers to maths learning.

EquatIO is free for teachers! Sign up at text.help/Equatio-FFT

The new **dux plus** for 6th Gen iPad 2018.

- Military-standard drop protection
- Super protective polycarbonate and rubberised TPU bracket
- Transparent so asset tags can show through and be scanned
- Apple Pencil or Logitech Crayon storage and protection
- Patented magnetic closure for easy folding whilst typing or viewing
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MIL-STD - 810G
DROP TEST
PASSED
26 DROPS FROM 4 FEET

iPad 6th Gen - 9.7"

- STM-222-190JW-01 - Black
- STM-222-190JW-03 - Blue
- STM-222-190JW-02 - Red

dux cases available for all iPad models.

Why I Love...

Thierry Delaitre, head of ICT developments, explains how STM is protecting tech investment at the University of Westminster

Protection is key

With 3,000+ mobile devices rolled out to students and staff since 2014/15, The University of Westminster truly understands the need to protect its tech investment. Starting with a deployment in the University's Faculty of Science and Technology – where 270 mobile devices were provided to staff in 2014 – the Mobile Learning Project saw a further 2,000 mobile devices rolled out to students in 2015. Due to this successful implementation, 1,000 more student devices were delivered in 2016. At each stage, device protection was a key consideration – saving time and money, and enabling the successful recycling of mobile devices to new students, plus contributing to the sustainability of this project.

Crucial design features

The STM Dux case was selected to protect iPads and other mobile devices for staff and students. Not only does the STM Dux's reinforced corners protect the iPad from inadvertent drops, its transparent back cover allows the University asset tag to be visible at all times. Design features like these – plus being insurance approved – have ensured STM remains the de facto choice for device protection at UoW, and an integral part of the Mobile Learning Project.

Tangible measures

Outside of cost, the most significant impact of protecting devices with Dux was the decrease in downtime. While the presence of the FST Helpdesk enables a speedy replacement iPad in the event a device needs to be repaired, it's the time not lost by students with a broken device that's made the most significant difference. Historically, the majority of damaged devices were due to cracked screens – either by being dropped or lack of protection in standard bags. Since the adoption of STM, device breakages have been less than 0.05%, thanks in no small part to the military-tested protection the Dux can give you against accidental damage.

Lifetime protection

In partnership with independent advisors, 4C Strategies, who provided programme management assistance for the university's managed service provision, there was a responsibility to bear in mind for the life of each iPad from an insurance and warranty perspective. Particular attention was given to identify best value for money, but also the long-term protection of the devices.

The primary choice

The hardware protection choice these days is vast, so selecting the most appropriate option can seem like a minefield – and in any teaching environment, broken devices means disrupted classrooms and a loss of valuable teaching time. Once the due diligence was complete, there was no hesitation in choosing the STM Dux as primary choice for protection and ensuring the University of Westminster's Mobile Learning Project was a tremendous success.

Get Your 'Dux' in a Row with STM

"Since the adoption of STM, device breakages have been less than 0.05%, thanks in no small part to the military-tested protection"

Thierry Delaitre – head of ICT developments, University of Westminster

For further information, please call 01256 378 690

Say *what* *you* SEE

Supported by great technology – and properly understood – visualisation can be a powerful tool for learning, as **Anthony Coxon** explains...

The benefits of visualisation are not a very new discovery. Two people in particular, a lot wiser than I am, recognised its power:

"If I can't picture it, I can't understand it."
Albert Einstein

"It is impossible even to think without a mental picture."
Aristotle

We all know that visualisation is the graphical display of information which stimulates the imagination, enhances involvement with the text, and improves mental imagery. Additionally, research shows that students who internalise information are far more likely to retain it and be able to apply it in a meaningful and relevant way.
But this ability to reason visually has become increasingly possible and important in today's digital information age.

The first, and most important, consideration for teachers is that for visualisation to be effective it must make connections between existing knowledge, and the knowledge being taught. If the students don't possess the knowledge to understand the graphical entities and the relations between them, the visualisation won't achieve its goal.

In the mind

Next, it's important to understand that the words 'visualisation' and 'imagery' are in some ways misleading. Visualisation needn't involve 'seeing'. Have you ever remembered something you experienced only to realise that it was a dream or something you imagined? Often, we can't distinguish between what we've seen with our eyes and what we've seen or thought about in our mind.

Therefore, in theory, visualisation doesn't have to involve live creations of the learning concept, or creating or finding an image to represent it. A detailed, guided description by a teacher can help students create mental pictures as they learn.

The digital solution

However, sometimes appropriate techniques, apparatus and materials are required for conveying key concepts, such as for the science curriculum at KS3 and 4, for example. And whilst most schools will be able to set up live experiments to cover learning objectives to do with simple machines, levers and hydraulics, and investigating how the extension of a spring is related to the applied force, this hands on approach to learning is not always possible.

Concepts that are too large, like the solar system, or too small, like cells and photosynthesis processes can be tricky to get across in the lab. And certain abstract concepts, such as nuclear radiation, are definitely not suitable for classroom experimentation! It is for content such as this that digital images and animations are so useful.

Revision is another example of where digital visualisation is the most appropriate way to learn. Even if the student has focused on a concept in the classroom through an engaging and memorable hands-on experiment, they are unlikely to be able to, or want to, recreate this when revising. A digital interactive visualisation is therefore ideal to consolidate the initial learning – and often to enhance it, too.

Static and interactive

Generally speaking, visuals can be classified into two categories: static data and interactive visuals; and both have a place in learning.

Today, static visualisations are commonly seen as infographics. They present a single view to explore. Drawing a situation, graphing lists of

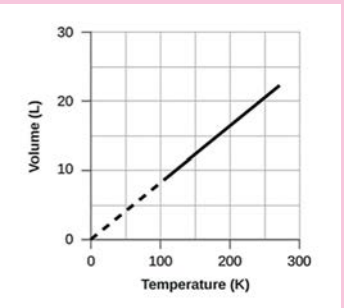

FIG.1

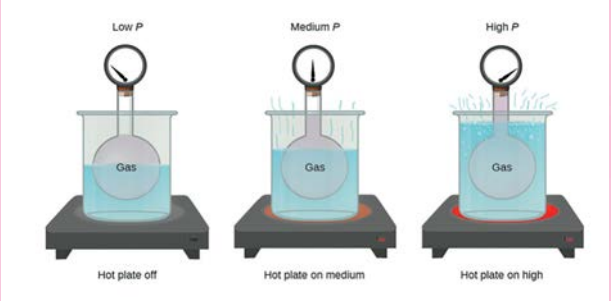

FIG.2

data, or placing numbers on a number line all help to make abstract concepts more concrete. Such data visualisation can come in numerous forms: timeline, scatter graphs, Gantt chart, stream graph, alluvial diagram, pie chart, histogram, Wordle, or bar chart.

Taking the scientific relationship between pressure, volume, and temperature as an example, the static diagrams shown here (fig 1. and 2., left) demonstrate the relationships between pressure, volume, and temperature, and how volume increases with temperature and in turn, pressure.

Teachers can search through image banks such as Pinterest rather than recreating their own, but finding effective images at the right level of development can be a long and laborious task for busy educators. And while these visualisations are certainly better than a teacher standing at the front of the class trying to explain the concept, an interactive visual which lets the student actually see the increase in pressure and volume with temperature, provides a more engaging and effective learning tool.

The question of which is better in any specific situation is very much down to the resources available, and the student's stage of learning.

"Students who internalise information are far more likely to retain it and be able to apply it in a relevant way"

Engaging and effective

All curriculum-aligned learning concepts in GCSEPod have graphical images, both static and interactive, to help students develop an in-depth understanding of each concept; saving teachers time in sourcing effective images without breaching copyright laws.

I believe visualisation is a powerful technique that makes all subjects – including science and maths – more engaging and interesting. In my view, there is no better learning tool to support students through effective revision.

All the schools we work with at GCSEPod observe their students gaining more confidence and showing more interest in their learning. Students love the autonomy of learning through digital images and animation, and the ability to replay and self-test at their own pace.

Whether a student is using visualisations in the classroom, independently to complete assigned tasks, or for revision, well created visuals give them the ideal 21st century way to learn.

VISUALISATION IN ACTION

Close your eyes and imagine this: You are in a field of strawberries with no one else around. The sun is shining, and you feel warm and relaxed. You are picking strawberries and putting them in a green bucket which is on the ground by your right-hand side. One strawberry is particularly large and ripe. You use your index finger and thumb to nip the green foliage off and then take a bite into the strawberry. It's sweet and utterly delicious.

You have manipulated your mind and body to believe that what you were visualising actually happened. In future, your brain will struggle to distinguish between what you saw in your mind/ remember thinking, and what actually happened.

ABOUT THE AUTHOR
Anthony Coxon is co-founder of GCSEPod (gcsepod.com)

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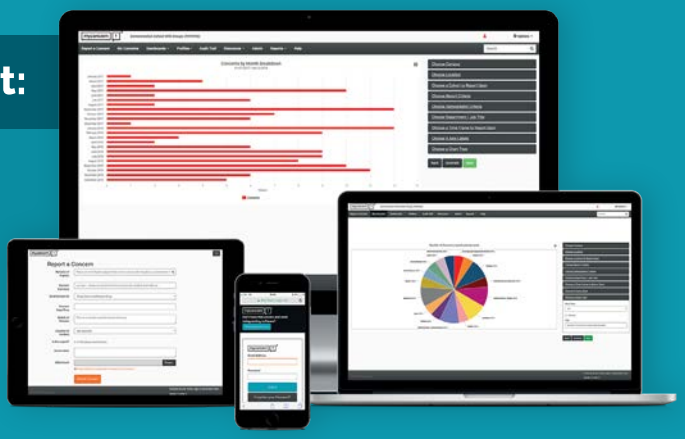

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Why I Love...

Caroline Newman, headteacher of Gladstone Primary School, Barry, explains how MyConcern Safeguarding Software has transformed child protection at her school

Gladstone is a large inner-city school with around 430 pupils. We have some challenging children here and a high level of free school meals. Previously we used a paper-based system to record well-being concerns and staff recorded everything in log books. It was a very clumsy system, which did not allow for high level reporting and spotting trends. MyConcern has completely changed the way we record and manage safeguarding and child protection in our school. All of this allows for a more focused approach to the main objective of learning.

I wanted a system which would be highly secure and instantly accessible. I'd never heard of MyConcern before, but as soon as I saw it, I knew it was something that I had to have in my school! I was incredibly impressed with the ease of reporting a concern, the level of security within MyConcern and how the system supported a holistic approach to safeguarding. It's the single most important system we have in school.

One of the best things about it is the fact that you are paper free and that the information is safe and secure. Any staff member, including pastoral or support staff, can access the system to update any small bit of information (that might prove to be important later on) and it just gives you peace of mind and security that you are not missing anything about a child that you are caring for. As a headteacher where safeguarding and child protection is paramount, it's invaluable. It's also superb value for money.

We honestly don't know how we'd function without MyConcern at Gladstone. It ensures that every aspect of a child is logged, supporting us to really understand what that child lives with and the impact on them in school. It helps staff working with our most vulnerable children to really understand, have empathy and to support them. We recognise that we cannot 'fix' experiences, but we can validate emotions and help a child to work through, come to terms with, or resolve trauma that they may still be experiencing.

I like the fact that it builds a comprehensive overview of each pupil, so if you wonder if a child has previous issues or wellbeing concerns in the past, you can go into MyConcern and see an overview of that pupil's history which is very useful when deciding what action to take. You can also invite trusted agencies e.g. social workers to view a concern. It's a brilliant service, has tightened child protection in our school and made my job easier – I can't imagine life as a headteacher without it.

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The whole TRUTH

Whether it's in front of an Ofsted inspector or in a court of law, digital records can have a vital role to play in evidencing best safeguarding practice, explains **Martin Baker**

"I would be grateful if you could explain to the court…." Having served from Constable to Chief Constable in five different police forces, I know only too well what it feels like to stand in the witness box and face this enquiry. This open invitation, usually from a solicitor or barrister, to explain my role and what action I had (or hadn't) taken was inevitably followed by a series of questions that, much like dismantling an onion, sought to delve deep, layer by layer, to get to what they were seeking to prove – my incompetence or negligence. This was not always during a criminal trial, in the Magistrates' or Crown Courts – the Family Court, Coroners Court, disciplinary hearings, inspections by HM Inspector all presented me with this 'opportunity' to explain my thinking and my actions, usually many months or years after the event. I was also required to produce the records detailing my decisions and my rationale for making those decisions, which relied on me having recorded, at the time, what I knew and when I knew it. And thank goodness I did!

It's the increasing regularity with which safeguarding leads in schools and colleges and other staff members are being called to account in this way that caused us to look closely at the use of technology for the recording and management of safeguarding in education. With our years of experience in safeguarding, and having examined the findings of literally hundreds of serious case reviews, it was obvious that digital records and technology could help to improve safeguarding and provide major support to reducing staff workload and stress. However, before adopting any technology for recording anything that might later be required as 'evidence' there are several important considerations that are widely misunderstood, and a few 'myths and legends' that need to be unpicked.

Valid records

The first is that "digital records are not admissible in court; everything has to be written down on paper" (advice allegedly given by some safeguarding 'experts'). I cannot politely describe what I think about this assertion, but it is entirely false. It is true that any evidence can be excluded by a court for any number of reasons; but not simply because it was digitally recorded. For example, High Street Banks no longer attend fraud trials with leather-bound ledgers written using a swan's quill and Quink – they submit digital records; the police don't take tonnes of cocaine into court – they produce the digital photograph.

As a Chief Constable my force used over 40 IT systems, many of which were evidential in nature and these records were regularly accepted in evidence by the courts. Indeed, the records from MyConcern have been highly praised in the Family Court, Magistrates Courts and Crown Courts, not least because the records are extremely well organised, are date and time stamped and – unlike paper records – cannot be torn up, shredded, altered, deleted or substituted (beware any system that allows deletion or alteration of records). Nevertheless, what is also true is that some paper records constitute primary evidence (e.g. the handwritten notes of a teacher recording a disclosure made by a child) that must be retained. However, that in no way precludes the incident

"Fears about sharing information must not be allowed to stand in the way of promoting the welfare and protecting the safety of children"

itself being recorded and case managed using a digital system.

Misleading guidance

A second myth circulating: when a pupil moves between schools and their safeguarding record is transferred to the new school any remaining records retained by the originating school must be destroyed. Some local authorities formally issue such guidance, which is very concerning – not least because it is potentially unlawful. The Department for Education's data protection toolkit for schools makes it abundantly clear that schools (and/or Multi Academy Trusts) are data controllers in their own right and as such, they make the decision about data retention under the auspices of the Data Protection Act 2018, not the local authority.

Furthermore, the ongoing Independent Inquiry into Child Sexual Abuse (IICSA) has long since issued a direction that no child protection records are to be destroyed until further notice. The DfE is currently working on data retention guidance for schools (including safeguarding records), while the Information Records Management Society Toolkit (v5), which many people see as the current definitive guidance, is also under review. The main point is that no-one can tell a data controller to destroy records – it is their duty in law to make that decision (and they should record their rationale for that decision).

Judgement calls

A third myth relates to the sharing of information and a fear that information cannot ever be shared without the consent of a parent/carer or the data subject. Again, the DfE toolkit makes it very clear that the Data Protection Act 2018 introduced 'safeguarding' as a reason to be able to process sensitive, personal information, even without consent (DPA, Part 2,18; Schedule 8, 4). The Guidance states that, "All relevant information can be shared without consent if to gain consent would place a child at risk. Fears about sharing information must not be allowed to stand in the way of promoting the welfare and protecting the safety of children. As with all data sharing, appropriate organisational and technical safeguards should still be in place". The important thing for practitioners to know is when information can be shared without consent; the DfE Guidance is immensely helpful (we know because we helped write it!).

Having personally supported school safeguarding leads both before and after court appearances, we know their message about all of this would be clear: safeguarding will get serious, so prepare. And begin with the end in mind.

ABOUT THE AUTHOR

Martin Baker QPM is former Chief Constable of Dorset Police; a school governor; and one of three founding members of One Team Logic, the company behind MyConcern – the safe and secure software for managing safeguarding electronically. See Martin at BETT in Solutions Den 1 on Thursday 24th January at 1.40pm.

YOUR DIGITAL SAFEGUARDING CHECKLIST

Investing in digital technology? Make sure you have answers to the following questions before you commit to a particular supplier...

+ Who hosts their software application (i.e. do they host it themselves or is it externally hosted? if so, where)?
+ Where will your data be hosted (the DfE requires all school data to be held in the EEA)?
+ What are the resilience arrangements (e.g. secure resilient data centres on separate sites)?
+ Has the supplier completed the DfE's Cloud Services accreditation document?
+ Can the supplier demonstrate compliance with the National Cyber Security Centre's '14 Cloud Security Principles'?
+ Does the provider (not just their third-party data centre) hold ISO 27001:2013, the latest version of the externally assessed international standard for information security management?
+ Do they hold the Government-backed Cyber Essentials 'Plus' certification (the 'Plus' is important – because it's the independent verification; the basic Cyber Essentials certificate is self-assessment only)?
+ Has their system been independently penetration tested? Will they disclose their pen-test certificate?
+ Is the application accessed by single factor authentication or two factor authentication?
+ Have you seen the provider's GDPR Compliance Statement, Private Notice and Lawful Basis for Processing policy?

"Something needs to CHANGE"

When trainees are being dissuaded from joining the profession, we have a serious problem, says **Sean O'Dea** - could technology provide a solution?

I became a science teacher because I wanted to share my passion for a discipline that, for some years, has seen dwindling numbers of students take up the subject post-GCSEs. Passion and positivity are contagious. I felt that if I could translate some of that energy into teaching and ignite curiosity in disengaged students who find science to be too challenging, too incomprehensible and too boring, then surely that would be a worthwhile mission.

The world, after all, needs scientific thinkers to develop solutions to some of the biggest humanitarian problems the world faces, and will continue to face, in our lifetime and beyond. Who will nurture the next generation of innovators if we can't pass on a sense of wonder for a subject that relentlessly strives to find answers to some of the most intriguing questions about our existence that has dogged the best minds for centuries?

Burnt out and beaten

No one ever becomes a teacher for the money or the holiday allowances. We are galvanised by our own experiences of education – good and bad – to make a difference to a child's potential.

As a student, I enjoyed school and I loved learning. I fully recognise that I was lucky enough to study at a school that was supportive but encouraging enough to make us want to do well, through hard graft and grit. But I'm also not so naïve as to believe that my experience is one that is shared by the majority of students. For many working adults now, there will be a sizeable proportion who'll profess that their school years were the worst. And perhaps that's why I felt compelled to become an educator.

I worked as a LSA (Learning Support Assistant) at a mainstream state school where I provided class support to 11-16 year old students with autism. I also worked as an Academic Mentor for Chemistry A-Level students, helping them to prepare for the exams. Indeed, there is no bigger learning curve to be had as a trainee teacher than in the classroom, where theory is put into action but where real life compounded by the idiosyncrasies of precocious children or hormonal young adults create work challenges that are sometimes beyond 'textbook'.

Throughout my time as a trainee teacher, over coffee break in the staff room or casual chat at the water cooler, seasoned teachers on multiple occasions were discouraging me from entering the profession. They believed they were doing me a favour. Burnt out and beaten down by unsustainable workloads, lack of freedom, crippling bureaucracy and inadequate pay, the fresh-out-of-graduate-school veneer of optimism, confidence and self-belief they once had was now chipped or long worn down to the nub.

Kicking the system

I don't think any teacher walks into the profession under the illusion that the job is going to be easy. Indeed, many do the work and then some, at the cost of their own time and wellbeing. It takes more than just academic ability to become a really good teacher; you need to be assertive, determined, dedicated to the job beyond belief, a role model to students, to peers and to aspiring and trainee teachers learning the ropes.

But, from what I perceive, there is a level of toxicity infiltrating the profession. Statistics have shown globally that teachers are increasingly leaving the profession in droves, burnt out and disheartened by the enormity of the job at hand and their inability (through no fault of their own) to have a meaningful impact in the classroom

"It takes more than just academic ability to become a really good teacher"

and the outcomes of children. There's a teacher retention and engagement crisis simmering away, but here's a recruitment issue, too - a proportion of this problem it seems is coming from practising teachers dissuading the next generation of trainee educators to leave the profession while they can. And this is really quite alarming.

Perhaps in a way this is some kind of a revolt. Where striking has failed, maybe teachers are starting to rally against an ineffective education system that seems to favour only the privileged or the lucky, via boycott or complete career abandonment. From what I've seen, teachers don't quit because they don't like teaching; it's everything else that ruins the job for them. And the real victims, of course, are the children.

New ways

Was I put off teaching because of what I'd been told, time and time again? I won't deny that it had an impact on my decision to 'park' my career for the time being. But by no means do I feel that I am completely finished with the classroom. My desire to promote education, promote the sciences and have an impact on schools and the educational outcomes of children is as keen as it has always been. I just believe that it can be done via a different route. Which is why I find myself working for an edtech venture that passionately shares this vision too. Maybe teachers need to disperse across all areas around education, not just within the classroom, to help inform policy and to drive innovation in relatively unchanged and antiquated teaching practices.

And you see that's the key here: innovation. A teacher today will need near superhuman abilities to keep on top of the basics of their work. Differentiated learning – such an important factor in ensuring the individual needs of a child is met – takes effort and time, and should not be (but is often) neglected. Grading of papers; lesson planning – again, necessary admin that can often overtake the actual act of teaching itself. Mentally and emotionally, over a period of time, a teacher can feel like they have very little else left to 'give' to their students. And in a standard state-funded classroom where social divides run deep and where teachers are often more than just mentors but social workers too, a child may feel unguided and let down in every aspect of their life.

I'm not saying that education technology and innovation is a panacea for these issues that classrooms face today. But I wholeheartedly believe that we aren't using technology and innovation in a big enough way to address what has become a social crisis. Funding, or lack thereof, has always been an excuse to fob off experimentation with edtech when, in the long run, the productivity it can bring in terms of the way teachers teach, children learn and how money is spent in schools can radically stem costly inefficiencies that are currently crippling the system. Something needs to change. Our old way of teaching and running schools isn't working. I want to become part of something that will help smash this inertia.

ABOUT THE AUTHOR
Sean O'Dea is school engagement executive at Zzish.

In the Spotlight

Brilliant ideas for better teaching and learning, for everyone...

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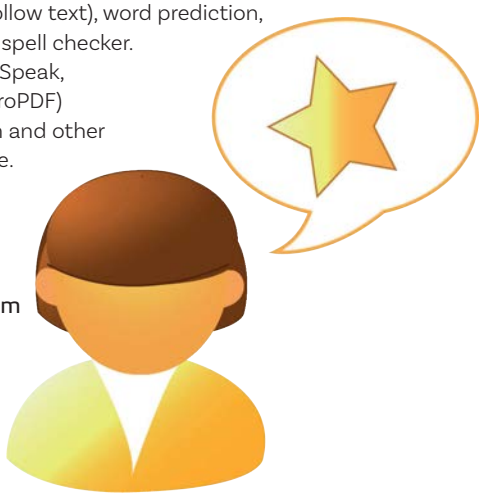

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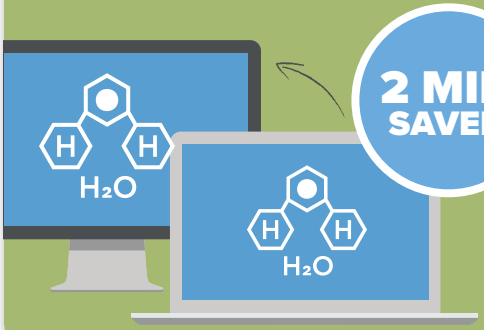

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A true history of FAKE NEWS

Unverified information on the internet can be a real problem for students and teachers alike – but help is available says **Karthik Krishnan**

Two hundred and fifty years ago there was no United States. No American or French revolutions. No Australia, Uranus, Neptune, or Pluto. No telephones, electricity, railroads, or cars. And Napoleon and Lincoln had yet to be born. At the time, Encyclopædia Britannica was a publishing phenomenon, and most people's first source of reference information.

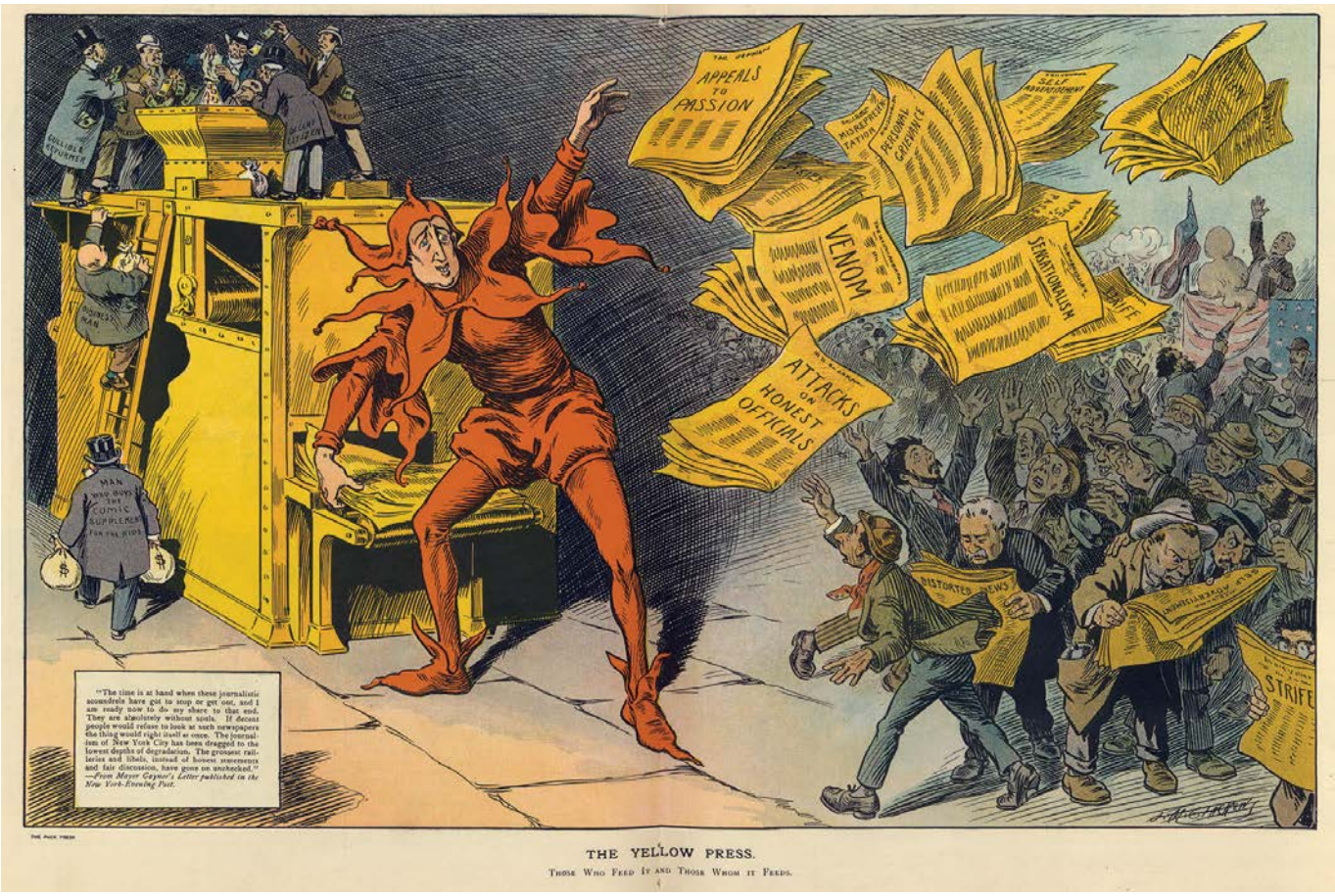
With the arrival of the internet came the move from using printed encyclopaedias to sourcing facts online, because of the ease of access. However, while a lot of information found in this way comes from credible sources, sadly a huge portion of it doesn't. According to an article in Scientific American, examples of fake news available online include, "NASA runs a child-slave colony on Mars!", and "Photos taken by a Chinese orbiter reveal an alien settlement on the moon!"

Strange theories

Many of the articles published by Britannica outline some of the earliest theories still held today but others, such as Peter Mark Roget's (1815–24) report on the eccentric Viennese physician, Dr. Franz Joseph Gall (1758–1828) highlighted less credible scientific theories. Dr. Gall's notion of cranioscopy had correctly determined that different parts of the brain were responsible for different human functions, but he was wrong in concluding that these different sections had 'organs' that could be felt on the skull. His other mistake was to suggest that personality traits and mental and moral faculties could be determined (and even predicted) by the shape of one's head.

Britannica, to its credit, dismissed this pseudoscience as quackery. You don't hear much about it today, but it appears to have been cutting-edge science in the early 19th century, just like the age old practice of bloodletting, which was covered in our first edition, in 1768. That set also reflected the then-widespread belief that "Callifornia" might be an island in the West Indies. (tinyurl.com/tandib). SHC – spontaneous human combustion – was one of the more unusual topics covered in Britannica's 3rd Edition (1788–97). Though most forensic experts believe stories of persons mysteriously consumed by flames can be explained by natural causes, such as lightning or a dropped cigarette, there are legions of SHC believers who attribute the conflagrations to everything from divine retribution for bad behaviour to an internal nuclear reaction.

There is, of course a fundamental difference between early theories from pioneering researchers of their time that may not have been completely accurate and deliberately 'fake' information. Unfortunately, today's search engine algorithms are not yet advanced enough to distinguish between information that is truly credible and information that seems plausible but isn't true.



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Reliable support

So where does this leave schools and students? The BBC's Newsround recently reported on experts from the University of Salford who believe children from the age of 10 should have classes teaching them how to spot fake news on social media. Even Paul Whiteman, general secretary of the National Association of Head Teachers (NAHT) has said: "Children and young people need to learn... to stay safe in a digital world. This includes being able to evaluate what they find online and make decisions about whether it is reliable and accurate or if it is fake news."

There are many tools available to support teachers, and at Britannica we are doing our part. Among other things, we have compiled a list of useful media-literacy tools that help (tinyurl.com/tandieb1), as we say, fight the fake. They include a host of printable infographics and other resources you can use in the classroom, as well as white papers on topics ranging from building critical thinking skills to incorporating literature into social-studies lessons.

Powerful resources

One resource we have developed to give students an understanding of how to identify trusted information, is our Building Career and College Readiness Skill whitepaper (tinyurl.com/tandieb2). One section focuses on helping teachers and students to 'evaluate online sources'. It provides teachers with step-by-step guidelines for introducing the topic and illustrates how students can use the tools provided to conduct an evaluation of online sources.

We also offer several lesson activities such as 'The five 'W's of website evaluation' (tinyurl.com/tandieb3) designed to give students the knowledge to identify legitimate, credible learning content, including considerations such as:

- Who wrote the pages and are they an expert?
- What information is included, and does it differ from other sites?
- When was the site created and last updated?
- Where does the information come from and can I find out more about the sponsor of the site?
- Why is this information better than another, and useful for my purpose?

Staying ahead

Providing people with the knowledge to be able to make their own decisions on the information they find is vital. However, other free tools such as Britannica School Insights for classrooms (tinyurl.com/tandieb4) and Britannica Insights for consumers (tinyurl.com/tandieb5) are also useful for schools and at home. Britannica Insights is a Google Chrome browser extension that lists links to highly relevant information from credible sources at the top of ordinary search engine results.

Let us work together to keep the knowledge foundation strong and improve our critical thinking skills, which along with our creativity and interpersonal skills might continue to be the key things that differentiate us from machines. We are building machines that are faster and more efficient than humans, so let us not lose our edge.

ABOUT THE AUTHOR
Karthik Krishnan is global chief executive officer of the Britannica Group. For more information, visit britannicalearn.com.

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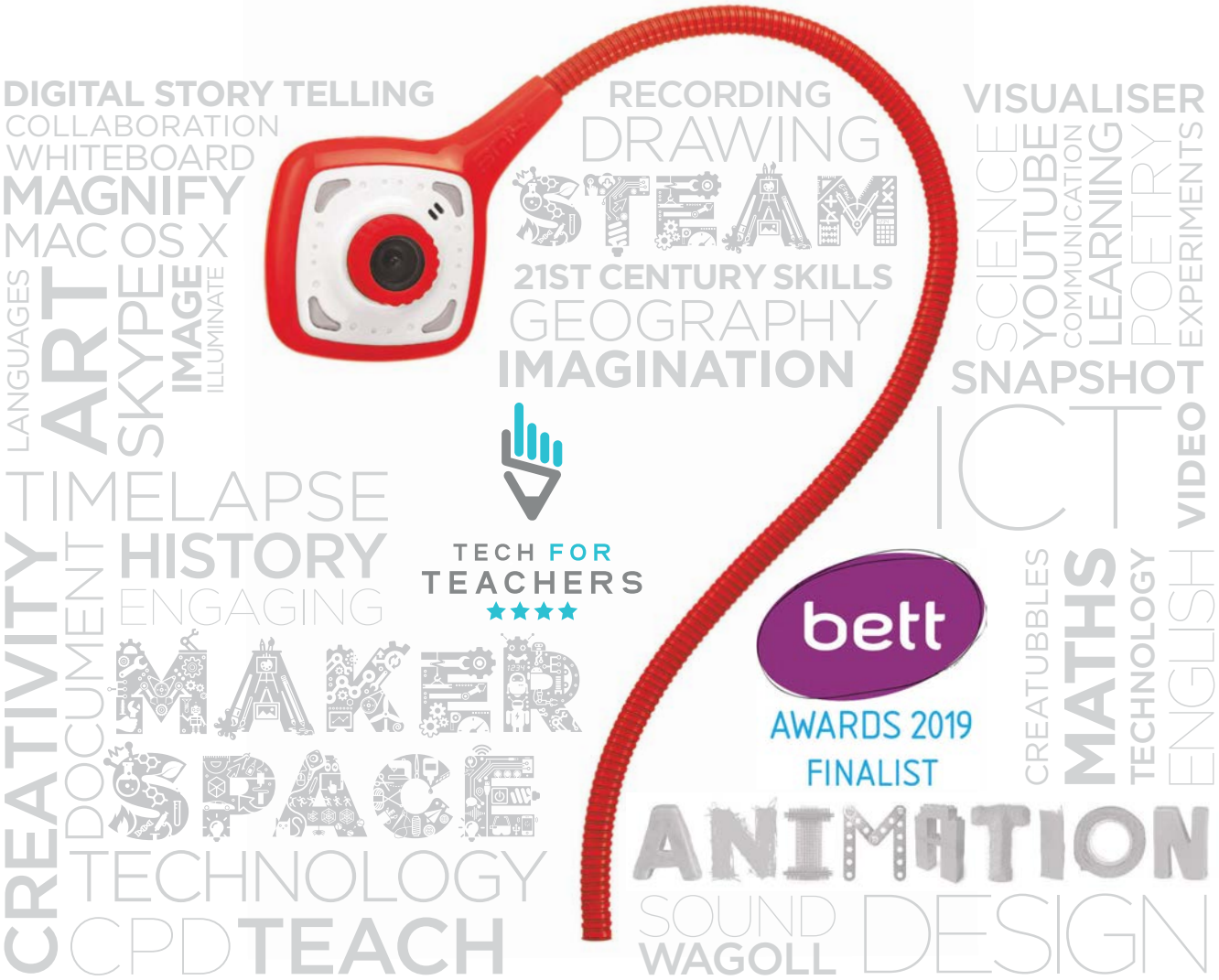

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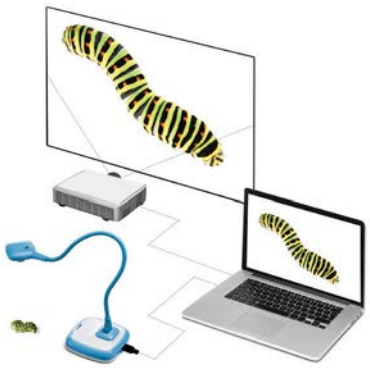

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Research proves that repeated and spaced revision has the most impact on exam results. When information is broken up into a number of short sessions and spaced out, the repetition of the learning point after a period of time helps students to remember it better long term. The increasingly wider spacing is important as it requires the learner to use more effort to retrieve the information each time.

7 OPPORTUNITIES

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- **Revise:** in the revision section, there are quick tests as you go

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- **Review:** topic-questions are revisited later in the book
- **Mix-it-up:** mixed exam-style questions appear at the end of the book
- **Workbook:** more topic-by-topic practice offer further exam practice

- **Exam paper:** a complete exam-style paper
- **Flashcards:** free Q&A flashcards are available online at collins.co.uk/revision

Each book also comes with an ebook version of the revision guide.

More information

Find out more at collins.co.uk/revisionthatsticks

bett AWARDS 2019 FINALIST

"We provide students with the tools they need"

At Ortu Gable Hall, technology is supporting students to thrive creatively, inside and out of the classroom...

"We are very lucky to have had the chance to nurture and produce some of the UK's top rising talent"

Ortu Gable Hall Academy has a culture for technology which enables students to do their best work. Adopting an approach where almost every year group has the chance to use industry standard technology in the music department has led to both individual and academic success. We have consistently used our music technology suite and recording studio to produce some of the UK's most talented young musicians.

We are very lucky to have had the chance to nurture and produce some of the UK's top rising talent in recent years. In April, one of our esteemed students, Ruti Olajugbagbe, won *The Voice UK*. While Ruti studied music technology at A-Level, excellent leadership from our music department enabled her to perform to the best of her ability, with technical support provided by Counterpoint IT services. Ruti's natural music talent and learning how to work in the recording studio allowed her to produce the highest quality work. The media suite provided Ruti with the skills and knowledge to apply her natural creative talent to modern day music production.

Our award-winning talent also includes Louisa Johnson, who collected the top honours on X Factor in 2015, while others have starred in Hollywood movies – such as Hayden Keeler-Stone, who featured in *Peculiar Children* with Samuel L Jackson, in 2016.

Professional standards

Access to industry technology has allowed our pupils to develop their skills to a professional standard across many areas of the music industry, including performing, composing and recording. We aim to provide students with the tools they need to be ready to make an impact in the industry. Equipping students with the facilities required to be able to create music with industry standard technology has allowed them to focus on creativity, and on producing the highest quality music.

All this achievement outside of the classroom can be related to the success we have had during term time. We are proud to say that we have had a 100% pass rate for our GCSE students in music this year, and we continue to maintain a high level of academic achievement year on year. Having media suites that allow learners to access their saved work easily allows them to continue where they left off straight away, wasting no time; getting the basics right can make the biggest difference to student success. Long lasting, reliable machines with backed up work creates an environment where Ortu Gable Hall can provide a productive learning environment and achieve the very best for our students academically.

Organised and integrated

Technology is a big part of Ortu Gable Hall's culture; there are 1 in 4 computers per student across the academy, with two media suites and a recording studio available for learners. Making sure the technology works seamlessly and operates in a Windows networked environment, is critical to productive class sessions and ultimately, student success. As Matt Thomson, a music technology A-level student at the school, says, "creativity can come at the drop of a hat, so it's important we can just load it up and get on with it."

The music department runs 100-minute classes three times per day. The sessions have to be well organised, integrating technology to ensure that the students' attention is kept on task. Our high performing Mac suites enable learners to reach their full potential, rather than causing headaches for teachers and students, who are likely to grow disenchanted if the tech doesn't do what it is supposed to do.

Ortu Gable Hall's students use professional music composing software such as Apple's Logic Pro X and learn how to use this effectively within a classroom and studio environment. These high end applications, however, are generally only designed to be used on standalone machines requiring fast access to local computer disks to operate correctly. Education, on the other hand, needs data to be mobile, available at any desktop and available in the recording studio to allow smooth and timely workflows in what is a time scarce teaching environment. Counterpoint's integration solution, EnhancedAD, and Ortu Gable Hall's healthy appetite for creative technology have made this possible.

We also run a roadshow every year where the students go out and perform their best work in local schools based on what they have learned in the classroom. This helps to build learner confidence in performing in front of large audiences. Put simply, when the music technology works in the classroom, we can then focus on what we do best.

See for yourself

During their time with us, young people are equipped not only with the tangible academic achievements that Ortu Gable Hall's music staff are now able to help them realise, but also with practical industry skills and confidence. The reliable music technology suites ensure that staff and students can focus on their creativity rather than on the hardware and software. This positive learning environment also allows students to build the skills they will need when working in professional recording studios in the future.

Looking to the future

We are excited to be attending the Bett Awards in January 2019 as finalists for the Impact Award. If you will be at the show, too, please do come and support Ortu Gable Hall Academy – you can take a look at our video entry here: **bettawards.com/impact-award-2019-finalists**. Ruti will also be joining us on the main arena stage at Bett on Saturday 26th January to perform her iTunes topping single 'Dreams'. Do come along and join us; we hope to see you there!

ABOUT THE AUTHOR
Faye Beamish is head of music at Ortu Gable Hall, in Stanford-Le-Hope, Essex.

VIRTUAL REALITY *is coming...*

... and it could help us to deal with some of the biggest problems facing education in the UK, argues **Matthew Murray**

The technologies that will change the world in the next 10 to 20 years have probably already been invented: they just need to become cheaper. One such technology is virtual reality, or VR – computer-generated experiences that immerse the user's sight and hearing.

This technology is already mainstream and people across the world are using it to play video games and watch movies. As the price of VR headsets falls over the coming years, they will inevitably find their way into our schools; and this could have extremely interesting implications.

Rich experiences

First, the rise of VR in education opens up the prospect of reverse field trips, where learners are taken on virtual tours of simulated environments. A few technology firms are already delivering such experiences in some UK schools. This could prove a significant development, especially for children from disadvantaged backgrounds.

A key aspect of the attainment disparity between disadvantaged and non-disadvantaged pupils is the so called 'word gap'. The range of vocabulary that a child develops is shaped to a large extent by their experiences outside of the classroom. Students from more affluent backgrounds are more likely to visit different countries, witness a range of environments and be exposed to more poetry, literature, music and art. They gain a wider range of vocabulary through a wider range of experiences. Often, disadvantaged children do not know words because they simply haven't encountered them.

Imagine being able to give young people experiences that they would not normally be able to access – being able to visit any country, see deserts, oceans and the polar ice caps. Placing learners into unfamiliar settings will necessitate their acquisition of language, in order to describe the environments that they find themselves in. Furthermore, they will be more likely to understand this vocabulary because they will be able to see words in action and in an authentic context.

Endless possibilities

As the price of VR falls, disadvantaged pupils will stand to benefit the most. They will have access to experiences that have previously only been available to their more privileged peers. This technology will help to level the playing field

Furthermore, VR could help to raise the aspirations of disadvantaged students. The only limit to the experiences that can be generated is our own imaginations. We would be able to put learners into the role of a doctor or pilot, for example. This could help to raise aspirations through increasing children's self-efficacy in such roles; in other words, their ability to imagine themselves doing these things.

VR technology has advantages over being read to, or watching something on a screen, because it is immersive. It is perceptually surrounding, so no matter where a learner looks, they are seeing the content of a virtual environment. In the context of education, pupils would be surrounded by their learning environment, with usual distractions outside of their field of vision – this could be a particularly useful aid for young people who struggle with their concentration.

Ultimately, the impact of this technology will depend on how much we invest in it. If the coverage of VR in UK schools is patchy, and teacher training in the area lacking, then its potential just won't be realised. However, if we choose to make the most of VR, the possibilities are literally endless – and we will be able to give children rich and powerful learning experiences that would've once seemed impossible.

ABOUT THE AUTHOR

Matthew Murray is a primary teacher in Manchester and creator of the site 2 Stars and a Wish, where he posts ideas for using songs, videos and poetry to teach literacy and guided reading.

@2_starsandawish

2starsandawish.com

Elevator PITCH

Use your existing iPad to capture video material from a wide range of educational activities

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Capture individual and group music performances taking place in the classroom, practice rooms, school stage, or any location around school.

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Uniquely designed to allow easily capture of a wide variety of classroom media projects, such as video production, green screen projects, digital storytelling, and journalism.

3 Drama
Allows you to record drama and dance performances in school, so that students work can be stored for playback, or sent off for examination purposes.

4 Sports
Record sports activities such as school sports day, athletics events and team sport matches, providing the PE department with video playback capabilities.

Counterpoint

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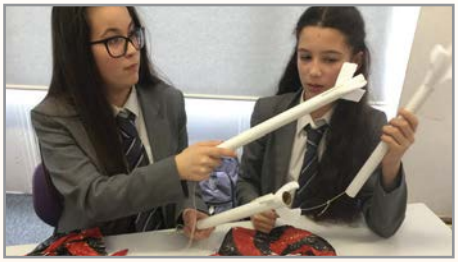


UK Space Agency

Two comprehensive STEM resources for KS3 and KS4 based on the James Webb Space Telescope and Satellite Launch Systems. Launch rockets, build telescopes and study the maths, science, engineering and design aspects of getting into space.

Building Service Engineers

Five case study interviews with engineers and associated design and make classroom activities for late KS2 and KS3 students including careers advice for those considering an engineering career.

Inspiring innovation – intellectual property in design

Lessons and a 'business day' developed for the Intellectual Property Office to allow schools to deliver this important aspect of product design. Students develop design ideas using smart and modern materials and the implications of not protecting their rights are revealed.

New resources for teaching product design

Materials and their properties

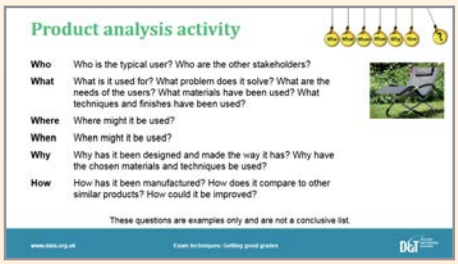
A set of classroom teaching resources helping students choose and use materials when preparing for their non-examined assessment and the GCSE exam. Includes metals, timbers, polymers, textiles and paper and boards.

Set of five PowerPoints:
Members £60.00
Non-members £80.00

Materials handling packs

A hands-on experience of different polymers, metals and textiles. Each box contains small samples of raw materials or finished products to which you can add further examples to make up a set to help students' understanding.

Each title:
Members £25.20
Non-members £30.00



Examination techniques: Getting good grades in D&T GCSE

Strategies for students to get the best from the chosen exam board specification to ensure they are prepared for success in the final exam. Includes detailed sections on each board's approach, sample exam questions, and top tips.

Members £20.00
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Visit the D&T Association website at: data.org.uk

DISCOVER THE WINNERS!

TECH FOR TEACHERS AWARDS, 2019

The judges have made their decisions, and we are delighted to be able to announce here the winners of the Tech for Teachers Awards, 2019; recognising edtech developments that are already making a real difference in schools throughout the UK.

Tech for Teachers is a unique awards scheme, with genuine classroom impact at its heart. In order to succeed, entries must be as effective as they are innovative, demonstrating real benefits for teaching and learning, value for money, and long-term potential – no fads allowed!

We started by inviting individuals and organisations throughout the sector to submit their very best products and resources for consideration. Shortlists were then drawn up in each of five, curriculum linked categories. Our expert panel then assessed these using a clear list of criteria, in order to bestow five-star, four-star and three-star prizes in each category.

The result is a superb selection of edtech developments, each of which has the potential to enhance the education experience for young people, reduce teacher workload and improve outcomes. From an interactive motion comic that can unlock Shakespeare for students, to a brilliantly engaging online platform aimed at building proficiency in times tables recall, the list is wonderfully diverse, with plenty to offer educators of all subject specialisms. Why not turn the page and start exploring for yourself…?

TECH FOR TEACHERS

THE JUDGING CRITERIA

- **INNOVATION** (Is this product/resource genuinely new, exciting, ground breaking etc.?)
- **BENEFITS TO TEACHING AND LEARNING** (Will it have real impact?)
- **LONG-TERM POTENTIAL** (Could this be a fad? Will it end up gathering dust?)
- **USER-FRIENDLINESS** (How 'geeky' do you need to be to get started, and/or make the most of it?)
- **VALUE FOR MONEY** (naturally!)

MEET THE JUDGES

MATHS

COLIN FOSTER is assistant professor in mathematics education in the School of Education at the University of Leicester

ENGLISH

CLAIRE MEYNELL is assistant subject team leader for English, Newport High School

STEAM

DR KEVIN P STENSON is chief executive of The Smallpeice Trust

MFL

JAKE HUNTON is head of modern foreign languages at a large secondary school in Solihull, and author

COMPUTING

TERRY FREEDMAN is independent educational ICT and computing consultant

WINNERS Maths

QAMA CALCULATOR

(QAMA)
Qamacalculator.com

A revolutionary calculator that shows the answer only when you also enter a suitable mental estimate – helping to reduce reliance on rote learning without mastery. And it's fun, too!

"A really cleverly thought-through device, which has the potential to get students to think about the size of their answer and avoid 'mindless' calculation." **Colin Foster**

TIMES TABLES ROCK STARS

(Maths Circle Limited)
ttrockstars.com

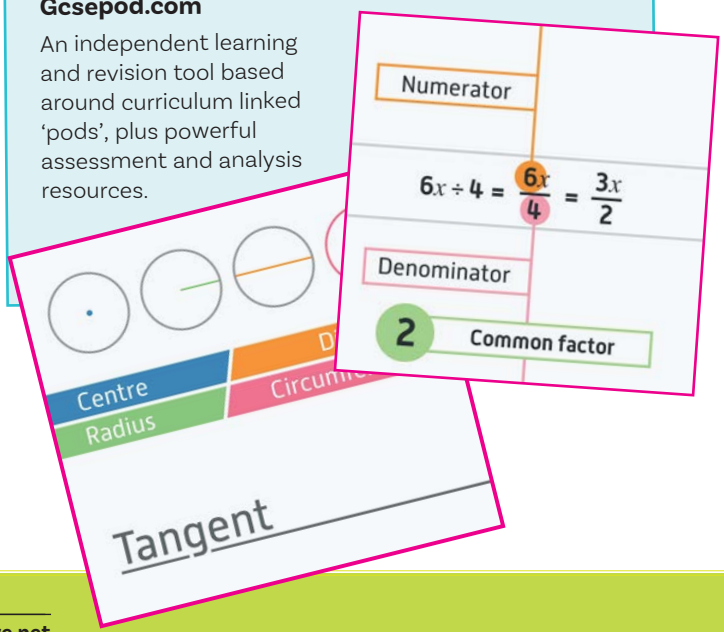
Times Tables Rock Stars is a carefully sequenced programme of daily times tables practice, which has successfully boosted recall speed for hundreds of thousands of pupils over the last eight years.

"TTRS is a fantastic product that is making a huge difference for many students. Very highly recommended!" **Colin Foster**

GCSEPOD

(GCSEpod)
Gcsepod.com

An independent learning and revision tool based around curriculum linked 'pods', plus powerful assessment and analysis resources.



CATEGORY FINALISTS...

Izak9 (Qubizm)
www.izak9.com/efficacy

Maths-Whizz (Whizz Education)
whizz.com

WINNERS English

TECH FOR TEACHERS

CLASSVR

(Avantis Education)
Classvr.com

A standalone Virtual Reality headset complete with a unique student-friendly interface, gesture controls, embedded educational resources and simple-to-use teacher controls, ClassVR is a groundbreaking new technology designed to help raise engagement and increase knowledge retention for students of all ages.

"Genuinely blown away by this - such amazing potential in the English classroom. One of my students commented it was 'sick', which I am assured is high praise indeed from a 14-year-old..." **Claire Meynell**

CATEGORY FINALISTS...

Approaches to 19th century texts in GCSE Literature and GCSE Language (Eduqas)
resources.eduqas.co.uk/Pages/ResourceSingle.aspx?rlid=1192

IDL Literacy (Ascentis - IDL)
idlsgroup.com

AUTHORFY

(Authorfy)
Authorfy.com

Authorfy works with leading children's publishers to create author-led masterclasses and cross-curricular schemes of work that enhance creativity, boost confidence, introduce students to new books, and improve literacy skills.

"Engaging resources that really inspire learners. Primarily suited to KS3; the price is reasonable for the subscription - and I would consider this in my department." **Claire Meynell**

MACBETH INTERACTIVE MOTION COMIC DVD

(Classical Comics)
classicalcomics.com/product/macbeth-interactive-motion-comic

A motion comic, designed to be used in a multitude of ways to fit in with many different teaching styles and to promote literacy in a differing caliber of pupils in the same classroom.

"This interactive DVD ties in well with the graphic comics - learners can read along with the dramatised animations. It has some potential for further development also"
Claire Meynell

WINNERS MFL

CATEGORY FINALISTS...

Yabla (Yabla, Inc.)
yabla.com

My French Exam (theLanguageApp)
microsoft.com/store/apps/9wzdncrdrbrp

LINGUASCOPE

(Linguascope)
Linguascope.com

A language learning website offering a wealth of interactive materials for students, and tools for teachers – great for independent work, home learning, and classroom activities.

"A classic and essential resource which is still as brilliantly interactive and useful as always." **Jake Hunton**

VOCAB EXPRESS

(Collins)
collins.co.uk/pages/vocab-express

A unique online platform that encourages students to learn languages independently with live scoreboards and competitions, featuring pre-loaded and categorised exam board content and easy-to-use tracking tools.

"A fantastic resource which ensures a level of exciting competition for the students as they compare scores to see who comes out on top in their learning." **Jake Hunton**

LANGUAGENUT SECONDARY

(Languagenut Ltd.)
languagenut.com/en-gb/secondary/

Extensive secondary school language resources for developing exam skills, offering teachers and students all they need to make and see progress.

"Excellent array of competitive activities, with progress monitored in a brilliant league table ranking style." **Jake Hunton**

WINNERS STEAM

TECH FOR TEACHERS

WEDO 2.0

★★★★★

(LEGO Education)
education.lego.com/en-gb/product/wedo-2

WeDo 2.0 makes science and computing come to life through hands-on tasks, real-world projects, and relevant technology that engages pupils. The unique combination of the LEGO® brick, classroom-friendly software, and inspiring, curriculum-relevant science projects results in a resource that builds students' confidence. Empower them to ask the right questions, define problems, and design their own solutions.

"Excellent use of a familiar product with the addition of technology that is ideal for young people."
Dr Kevin P Stenson

★★★★

HUE HD PRO

(Ascent Information Technology Ltd t/a HUE)
huehd.com/pro/

The HUE HD Pro classroom camera and visualiser can view a full A4 or US letter sheet and project it onto the whiteboard via your PC and projector.

"Modern take on a school projector with additional, fun benefits."
Dr Kevin P Stenson

CATEGORY FINALISTS...

Category finalists: Editable teaching resources and textbooks for Design and Technology (PG Online)
pgonline.co.uk

GCSE Achieve - Science (bksb)
bksb.co.uk/products/gcse-achieve

★★★

THEORY WORKS

(ABRSM)
itunes.apple.com/gb/app/abrsm-theory-works/id1415709055?mt=8&ign-mpt=uo%3D

ABRSM Theory Works contains over 6,000 specially-written questions to test and challenge music theory knowledge.

"Engaging app that aids learning in an easy to use way."
Dr Kevin P Stenson

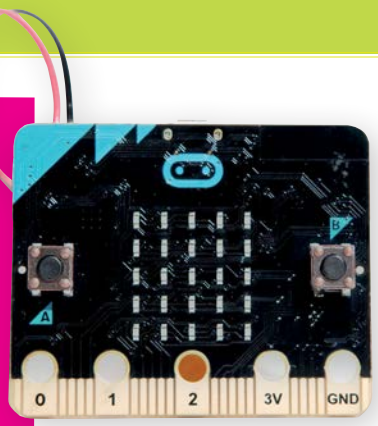
WINNERS Computing

BBC Micro:bit

(Micro:bit Educational Foundation)
Microbit.org

A handheld, programmable micro-computer that can be used for all sorts of cool creations, from robots to musical instruments. It can be coded from any web browser in Blocks, Javascript, Python, Scratch and more; no software required, and hundreds of activities to try with it can be accessed online, for free.

"Being able to create something that is an actual object with your own code makes this device not only exciting, but potentially a great introduction to other areas, such as the internet of things."
Terry Freedman



CATEGORY FINALISTS...

Creative Computing Curriculum (Mr Andrews Online)
www.mrandrews online.co.uk

Grok Learning (Grok Learning)
groklearning.com/

FUZE NINTENDO SWITCH

(FUZE Technologies Ltd)
fuze.co.uk/nintendo-switch.html

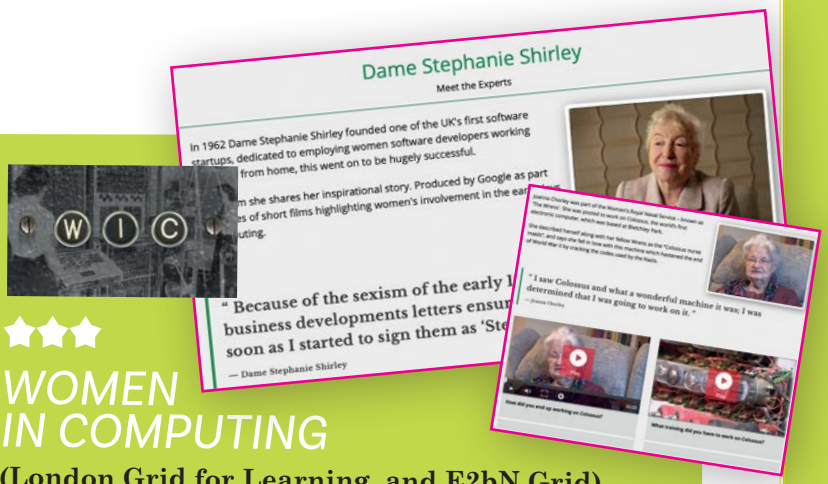
Turns the NIntendo into a serious computer programming device, and helps students to learn the concepts of programming and gain familiarity with the syntax used by both BASIC and Python. Note – not available until April 2019.

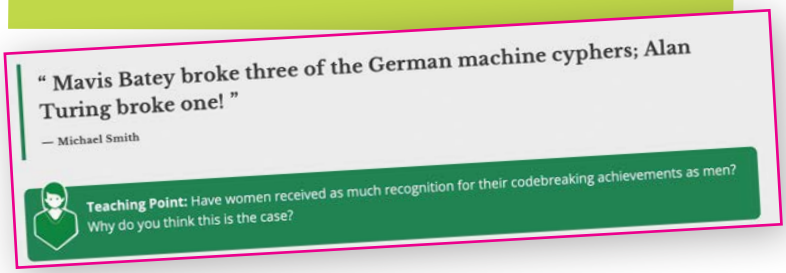
WOMEN IN COMPUTING

(London Grid for Learning, and E2bN Grid)
Wic.lgfl.net

A high quality resource that aims to recognise and promote the achievements of women in British computing within the social context of the time.

"This is a great resource both for teaching about the history of computing and, I think, for encouraging girls to take up the subject." **Terry Freedman**





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Invest in IMPROVEMENT

Thinking of spending your 'little extras' windfall on innovative IT to 'spearhead the classroom revolution'? Let's talk about it, suggests **Alan Cowley**

When Karl Marx defined 'revolution' as a 'class struggle', little did he know how, in the early 21st century, that phrase would ring true for so many teachers in England when a different definition of 'class' is applied.

Whilst Damian Hinds might balk at my comparison with Marx, his use of the phrase 'classroom revolution', together with some other recent and significant policy moves, prompts me to believe he's acknowledging the need for some wider, radical changes in the way schools manage the learning process.

The recently proposed changes to the Ofsted Inspection Framework, and the publication of the government's workload reduction policy, signal revolution in the way we work in schools, moving away from data-driven outcomes to a focus on the quality of the learning experience. Learning is all about effecting change – as a profession we need to start embracing it.

Shiny and new?

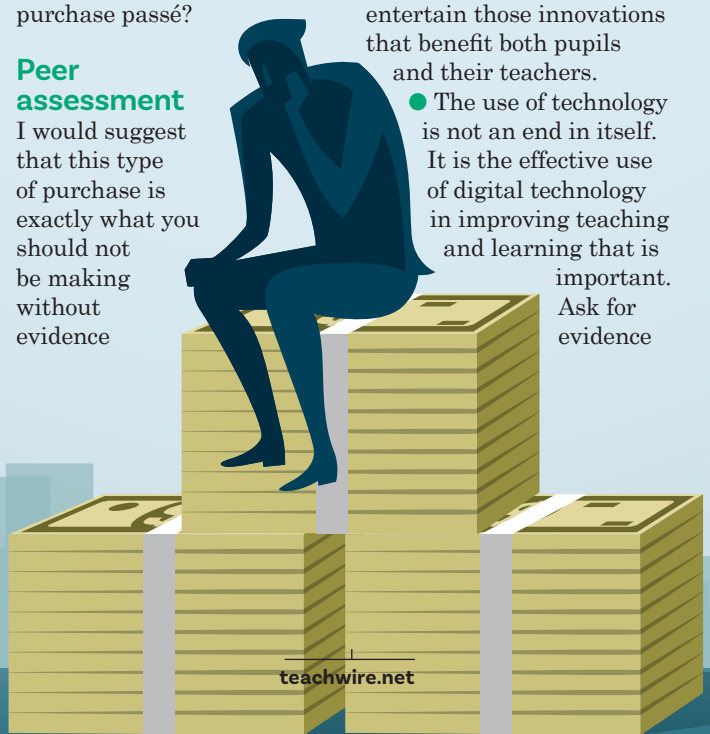
It was to the IT industry that Damian Hinds turned for the source of innovation to 'spearhead the classroom revolution', but as most of us have cupboards full of long-forgotten, outdated, digital hardware and software, how can we ensure that we don't fall into the trap of being sucked-in by this year's must-have piece of kit?

Indeed, through his press release, Damian Hinds spoke about having seen lessons where pupils were using a virtual reality headset to explore the rainforests. Assuming that it's a good idea not to have a headset that requires a mobile phone to access the software, you're looking at spending £250 - £500 per headset from your budget 'windfall'. What's that? Oh … you have 30 pupils in your class? Well, that's £7,500 to £15,000 you've just blown and, given the speed of updates in our IT hardware, how long before the next generation of virtual reality experience comes out making this purchase passé?

Peer assessment

I would suggest that this type of purchase is exactly what you should not be making without evidence of impact, as well as cost effectiveness. The Education Endowment Foundation itself says that the pace of change is so fast that meaningful evidence from randomised control testing is difficult to provide for IT products, but that doesn't mean that evidence doesn't exist; the professional judgement of colleagues in schools involved in the creation of an innovation, or who have adopted and used a new system, has been a long-established method of judging quality. Surely, the application of the guiding principles of what makes an effective IT development, established by the EEF in 2012 and still applied by them today provides robust guidance:

- The most common justification for change in educational practice is its benefit to pupils. In the current climate it is wise to entertain those innovations that benefit both pupils and their teachers.
- The use of technology is not an end in itself. It is the effective use of digital technology in improving teaching and learning that is important. Ask for evidence of how the innovation motivates or supports pupils to work harder, longer, or more efficiently, to improve their learning.
- Pupils' motivation to use entertaining technology does not automatically lead to improved learning. Exactly which effective strategies for improving pupil learning does the system support?
- It is important that teachers fully understand how innovative technology or a new methodology can improve learning. Understanding how to use the technology is usually the easy bit! Does the IT system offer thorough and evidenced training to support implementation?
- School leaders and teachers are best placed to advise on those areas of their practice that need to be improved, whether to reduce workload or make the process of learning more efficient and effective. The best and most meaningful innovations develop out of close collaboration between schools and IT providers. The over-reliance on data driven decision making has produced an 'audit culture' within education; perhaps it's time to use conversation instead.



ABOUT THE AUTHOR
Alan Cowley is co-founder and CEO of Engagement in Education Ltd.

Mathletics is an award-winning digital maths resource created by educational experts, specifically developed for secondary age students.

Mathletics

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Head of Maths, Hertfordshire.

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Executive Principal, Bushey Meads School.

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