Our Winter Term edition is once again led by Miles Berry, Professor of Computing Education at the University of Roehampton, and a contributor to a wide range of computing projects.

SAPIENTIA

From ICT for Education

Everything you need to know about Computing, the curriculum, and the classroom.

Welcome to the third edition of Sapienta, ICT for Education's termly newsletter that provides education professionals with thought leadership, an insight into hot topics, and practical guidance on how to implement new technologies to improve teaching and learning.

This edition of Sapienta leads with an article by Miles Berry, Professor of Computing Education at the University of Roehampton. Berry considers the problems of engaging students in computing. He suggests making computing lessons more enjoyable, which will, in turn, help students learn more and perhaps carry on studying the subject to gain qualifications.

But how can this be done? Berry proposes a broad interpretation of the national curriculum progammes of study, and a creative approach to computing that could include working a across a range of digital media. Critical digital literacy helps students contribute positively to the increasingly digital world, and making the content of the curriculum more relevant helps them develop valuable skills across new technologies such as generative AI, virtual reality and robotics. He concludes, GCSE and A Level specifications are about what gets tested, not what can or should be taught.

An article by Tig Williams, a member of the CAS board, discusses how to write an AI policy for your school, a

pressing problem exacerbated ty the emergence of ChatGPT and other generative AI and large language models.

Williams notes the challenges of using AI in school, including plagiarism and issues around child protection, data protection, bias, and hallucination. He also considers the boundaries that an AI policy should put in place around the positive and negative uses of the technology. Considering students that rely on generative AI and don't see a need to learn, he raises a red flag as these students won't have the knowledge to decide if an answer from an AI solution is accurate.

To keep pace with the changes, challenges and opportunities in the primary and secondary education sectors, register for ICT for Education's termly newsletter here or e.mail il@ictforeducation.co.uk. And don't miss our live ICT for Education events, where you can listen to expert speakers including Miles and Tig and network with colleagues. **Click here** to find out more and register for upcoming ICT for Education events.

Sarah Underwood Editor - ICT for Education

Engagement in computing

By Professor Miles Berry, Professor of Computing Education at the University of Roehampton.

Some teachers address engagement in computing well, but by and large this does seem to be a problem in too many computing lessons. This isn't new. Back in the days when Ofsted was HMI (1989), the inspectorate reported that many experienced computing as 'dry, dull and unexciting'. Before the switch from ICT to Computing 10 years ago, Michael Gove complained of 'Children bored out of their minds being taught how to use Word and Excel by bored teachers'.

While there's much less Excel taught these days, I think the problem of boredom remains. Data from the Wellcome Trust suggests that pupils' interest in computing drops off during secondary school – 75% find it interesting in Year 7, but only 38% in Year 11. This is despite the enthusiasm that pupils show for using digital technology outside of

school – from social media through gaming, to creating music, photography and video.

It's worth improving this. Firstly, so that young people have a better time of it at school, making computing lessons more enjoyable. Pupils who enjoy their computing lessons are going to learn more, are more likely to carry on studying this for qualifications, and are less likely to present challenging behaviour, making these lessons more enjoyable for teachers too.

What can be done to make computing lessons more engaging? It's worth exploring both what we teach and how we teach it.

Curriculum

The national curriculum programmes of study provide a minimum entitlement for all, but they can be interpreted very broadly and impose no limits on what can be taught. Over the years since the curriculum was introduced, and partly as a result of the narrow focus on theoretical aspects of computer science at GCSE, there has been disproportionate time spent on things like system architecture, binary arithmetic, Boolean logic and network protocols even at Key Stage 3.

Wouldn't it be better to use the all too limited subject time to give pupils a broader experience of the subject? Yes, this should include programming, as Simon Peyton Jones put it, "Without programming, computer science would be a dry, theoretical husk of a subject". It can also include some introductory data science, some creative work across a wide range of digital media (including music, video, animation and games), as well as the sort of critical digital literacy that would equip pupils to make sense of, and contribute positively to, an increasingly digital world. Remember that GCSE and A Level specifications are about what gets tested, not what can or should be taught.

Beyond this, it's worth thinking about how the content of the curriculum can be more relevant. Look for ways to make connections with the latest developments in technology, making use of the latest tools; helping pupils develop their knowledge of and skills with emerging areas such as generative AI, virtual reality and robotics; and addressing issues such as bias in training data, the harms of social media and cyber threats. Alongside this, think about how the curriculum can better reflect pupils' own interests and experiences, and pay more attention to their

own identities and cultures. Look for ways to make connections with the real world, through the use of real data, real tools and real problems.

Pedagogy

What we know about effective teaching applies to computing as to other subjects, so fundamental ideas like linking new knowledge to existing knowledge, breaking content down into manageable chunks, modelling through worked examples, reducing extraneous cognitive load, and providing opportunities for pupils to practice and apply their learning are all important. Mastering new knowledge and skills is itself engaging.

Remember that this is a creative subject, having at least as much in common with the pedagogies of art, music and design and technology as it does with those of mathematics or science. Seymour Papert's great insight was that pupils learn best when they are engaged in making something: that they make something in their head through making something in the world.

Creative work motivates and provides context and application of learning. Computing is about studying in order to build. Make time for meaningful, extended projects for pupils, in which they're actively engaged in making artefacts as well as connections, where they have at least some choice over what they make and the tools they use, and where they can share their work with others.

Recognise the importance of collaboration in computing. Beyond school, programming and other IT projects demand team work and careful coordination, and some experience of the problems and opportunities that this brings can prepare pupils for higher education and employment, as well as making the subject more engaging. Why not let pupils work together on creative projects, exam questions and challenging problems? Pair programming, a development method in which two coders work together sharing the screen, keyboard and mouse, with distinct 'driver' and 'navigator' roles, is an effective approach in real-world software engineering, and helps in the classroom too. There's nothing in the current practical programming requirements for OCR that requires the work to be done individually.

There's a difference between how novices and experts learn, and it's safe to acknowledge that for most

curriculum content most pupils are novices. Thus, they're likely to need more support, more scaffolding, more worked examples, more modelling, more practice and more feedback than an expert would. However, some pupils already have, or quickly develop, a degree of expertise in the subject, and their ongoing engagement comes through adapting teaching approaches to take this into account. Encourage independent learning: there are excellent online resources that a well-motivated pupil can access for themselves, set challenging problems, and provide opportunities for community participation and leadership.

I don't think engagement is a binary thing, there are degrees to this. For pupils to learn in class, there needs to be attention as a minimum, but beyond this, work to see pupils increasingly committed to their tasks and to the subject. Help them become persistent learners and technologists, reluctant to give up in the face of problems. Adapt the curriculum, and your teaching, so that they see meaning and purpose in their learning.

Professor Miles Berry

Miles Berry is Professor of Computing Education at the University of Roehampton. Before joining Roehampton, he spent 18 years in schools, including a period as a head teacher. He has contributed to a wide range of computing projects, including the computing programmes of study in the National Curriculum, Barefoot Computing and Switched On Computing. He serves on the boards of Computing At School, the BCS Academy of Computing, and the National Centre for Computing Education, and is a regular keynote speaker and international consultant on curriculum and professional development. He is @mberry on Twitter and find out more on milesberry.net

Writing an AI Policy for your school

By Tig Williams, NCCE South RDP Manager Master Teacher, Hub Leader, Secondary School Teacher (11-16), Teacher Trainer, and IT Professional.

Increasing use of machine learning tools means schools must look at how they adopt, use and manage staff and students' use of generative AI. From ChatGPT to Deep AI video and coding tools there are a plethora of applications that are freely available to teachers and students alike. As with any significantly disruptive technology, we need to ensure students understand how to use it safely.

Some schools have attempted to ban use of AI without researching what it is and its potential. This is a mistake, if you ban AI you have to stop using google (and most other search engines), siri, cortana and MS Office 365 as they now all contain AI elements. What schools need to consider in the first instance is, 'What is the problem we need a policy for'. Like a behaviour policy, schools need to consider what they are trying to control. In most cases, this is the use of generative AI tools and a reliance on them.

The obvious issue for schools is students using a generative AI tool to produce work they will submit as their own. This is already covered by plagiarism policies so why do we need a new one for generative AI?

We need to identify the issues before we can sensibly create a policy to address them. Plagiarism is one, but there are more we need to be aware of including, but not limited, to:

- Child protection
- Data protection
- Bias
- Hallucination
- Requirement of domain knowledge to assess input and output.

Child Protection

In the summer of 2023, Unicef published Generative AI: Risks and Opportunities for Children (https://www.unicef.org/globalinsight/media/3061/file). The

publication identified the following key risks of generative AI:

- Persuasive disinformation and harmful and illegal content at scale and lower cost.
- Given the human-like tone of chatbots, where the line between animate and inanimate blurs, what are the impacts on children's development – and privacy – when they interact with these systems?
- Modification of children's behaviour and worldviews – intentionally or not.

Some of these risks we cannot directly address, but our policy should be about educating our students about the risks so that they can use these tools and interact online with an informed awareness of the risks of bias, inappropriate material, and disinformation. Generative AI tools can allow our students to bypass traditional web filters, so it becomes more important to teach them about sensible and safe use than simply trying to ban content.

We should also have a policy section about students generating inappropriate content using 'deep fake' technologies and students should be made aware that this is not acceptable, or we risk having no rule to fall back on when a student generates inappropriate imagery using another student's likeness.

Data Protection

Generative AI tools harvest information on a large scale so we need to be sure that if we use a tool to grade students work, we have a way to anonymise the data given to the tool unless it is secured in line with school GDPR policies.

Bias and Hallucination

Generative AI tools are only as good as the data they are trained on. We need to identify this and make explicitly clear that data from these tools needs to be checked before being relied on by both students and staff. Both groups also need to be aware that most generative AI tools hallucinate. This is where they 'make up' information either to prove a point or to bulk out generated text. Staff generating tasks and materials using the tools must be aware and actively checking this to avoid disinformation. Students should be aware of hallucination to avoid falling foul when researching and starting work.

Disinformation

These tools can generate a vast quantity of text in a very short space of time. Generating disinformation is a common use of Generative AI at both individual and state level. Your policy needs to consider this when outlining how staff and students interact with data. This could potentially be added to social media use policies.

Positive Use

Generative AI is embedded in almost every walk of life now, so we need to give schools (staff and students) basic training before we expect them to be able to use it effectively. Part of your policy should be an undertaking to give some training to your staff (even if that is simply time to experiment with the tools during an inset to figure out the best ways to use them).

A good AI policy should assume the tools are being used by students and outline the limits of positive and negative use. For example, which of the following would you consider acceptable:

- A student uses a generative AI tool to summarise research in a field and takes this initial start and writes the rest themselves.
- A student writes an essay but then gets a generative AI tool to reword it.
- A student writes an essay and then uses generative AI to create the summary section at the end.
- A student uses a generative AI tool to write the essay.

Academically, in all but the last example, all the AI tool is doing is saving students some reading. The last is definitely cheating. Your policy needs to define the difference.

Lastly, some students will rely on generative AI and not see a need to learn anything. While this may not go into an AI policy, they need to be taught that if you don't have domain knowledge, you won't know what to ask in the first place. More importantly, you won't have the knowledge to decide if the answer it gives you is even remotely accurate.

If you are in charge of writing your school AI policy and helping others in your school get the hang of these technologies, come along to some of our sessions and, if

you can’t get to those, here are a couple of places I have found useful:

https://www.aiforeducation.io/ai-resources

https://stefanbauschard.substack.com/p/ai-policy-considerations-for-schools

Tig Williams

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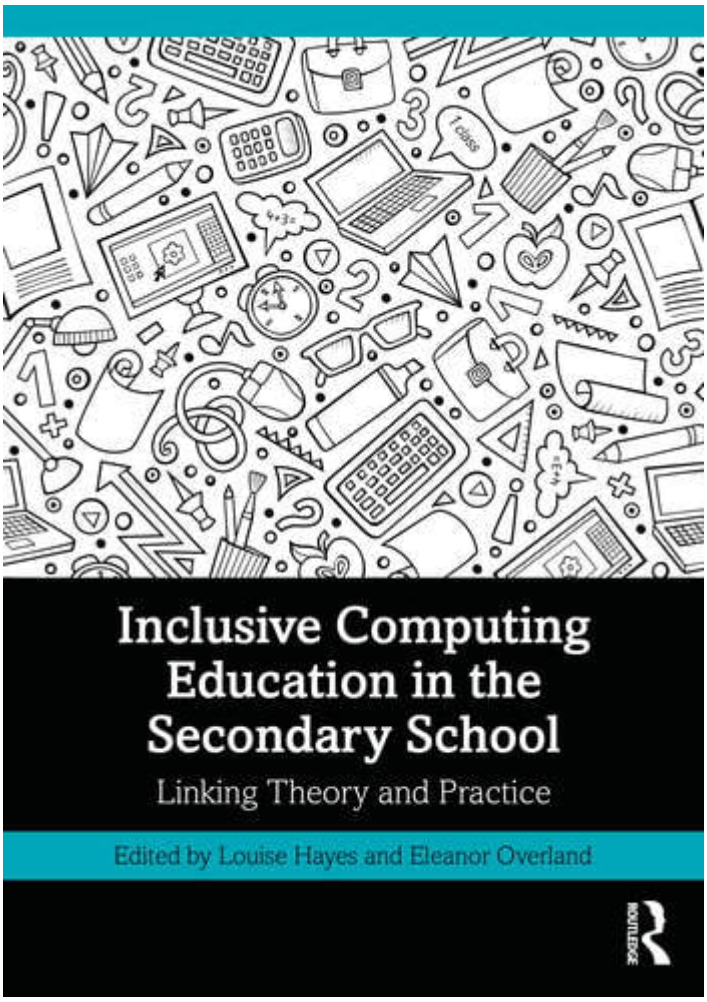
Further reading



Inclusive Computing Education in the Secondary School. Edited by **Louise Hayes**, Senior Lecturer in Initial Teacher Education at Manchester Metropolitan University **and Eleanor Overland,** Director of Quality Assurance for Initial Teacher Education at Manchester Metropolitan University.

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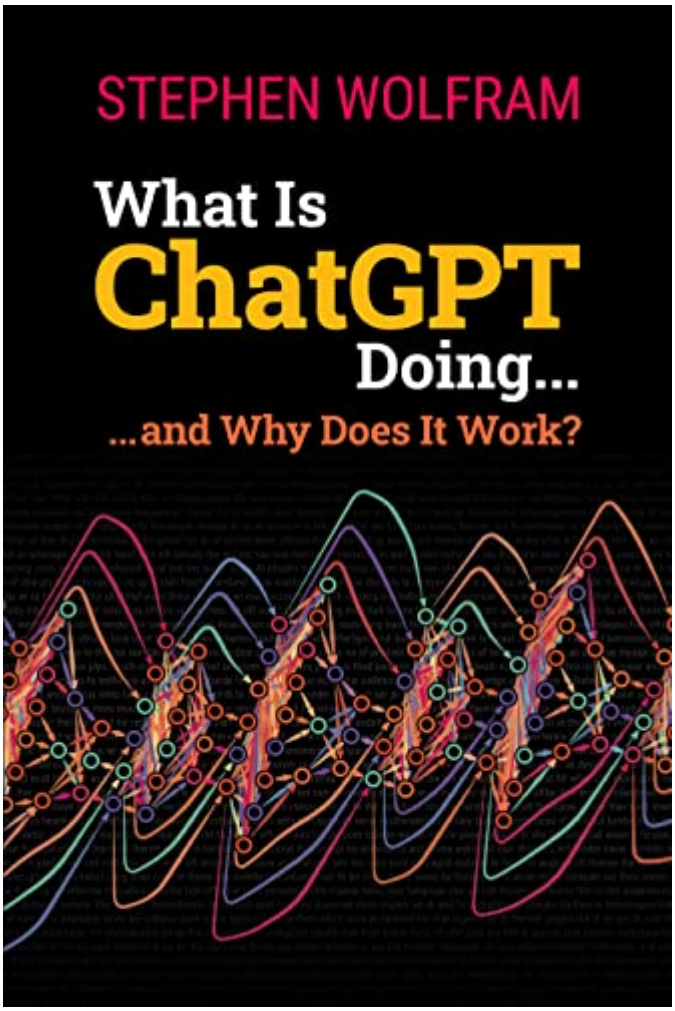

Miles Berry, Professor of Computing Education at the University of Roehampton recommends *Wolfram, S (2023) What Is ChatGPT Doing...and Why Does It Work? Wolfram Research Inc.): "Stephen Wolfram created Mathematica back in 1988, and 35 years on it remains the leading platform for doing mathematical work on a computer. Wolfram|Alpha is one of the first plugins available for ChatGPT, significantly improving its skills at maths. Here, he gives an accessible introduction to large language models and the machine learning algorithms on which ChatGPT is based. This is useful reading for teachers using it, and a good addition to a secondary school library.*

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