Our Summer 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 second edition of Sapientia, ICT for Education's termly newsletter that provides education professionals with thought leadership, insight into hot topics, and practical guidance on how to implement new technologies to improve teaching and learning.

This edition of Sapientia leads with a focus on ChatGPT. Miles Berry, Professor of Computing Education at the University of Roehampton, discusses the technology that powers ChatGPT and considers potential use cases identified by teachers. These include: creating lesson plans; identifying content for presentations; building multiple-choice quizzes; and making a mark scheme that produces model answers for exam questions.

Berry also suggests that ChatGPT, and other large language model generative artificial intelligence, could fulfil some, but by no means all, of the roles of a teacher. Limitations here include the extent to which the technology has been trained, its inability to get everything 'right', and its potential to cause ethical issues.

A second article, written by Amy Cartwright, Head of Computing and Head of Digital Innovation and Learning at Ibstock Place School, underlines the importance of Computing in the curriculum. Cartwright argues the case for more time and commitment to be invested in

Computing in secondary schools. This would not only equip pupils with the skills and knowledge required to find interesting jobs in industry, but also help employers source the capabilities they need in an increasingly digital world.

Challenging the status quo of Computing being considered as a special subject, but not an essential one, Cartrwight concludes that there must be a shift in mindset towards computing education if schools are to prepare learners adequately for the future workforce.

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 and network with colleagues. During the summer term, we will host seminars and conferences in Reading, Norwich, Manchester, Brighton and Southampton. Click here to find out more and register for upcoming ICT for Education events.

Sarah Underwood

Editor - ICT for Education

ChatGPT for pupils

By Professor Miles Berry

Have you ever watched your pupils writing on an iPad? For their generation, this seems almost natural, with many developing a muscle memory for the 'keys', and others making use of built in tools to make text-entry that bit easier, including speech recognition and swipe-based keyboards. More interesting still is the way many pupils opt for machine-generated suggestions offered as predictive text above the keyboards as it seems possible for many pupils to create quite lengthy stories or essays by choosing one of three words offered as a suggestion.

The technology that powers predictive text is similar to, but far less powerful than that which powers ChatGPT, Bard and other large language model generative artificial intelligence. Broadly, these technologies work by deciding what is the best word (or 'token') to pick next, based on

the prompts received and all the words responded with so far. There is a bit more to it than that, as much of its character is determined by the semi-randomness ('temperature') of the text generated.

The probabilities of what token might come next are based on the large body of text from the open web on which the technology has been trained. I don't think there is any strong sense in which ChatGPT *understands* these texts, although it might appear to do so. Nor has it any real sense of which sources are more reliable than others, although it does have a sense of what is 'normal' and what is not. It has also been trained to be polite and to avoid swearing, and its developers have built in a number of safety features to prevent it from generating text that might be offensive or inappropriate.

ChatGPT use cases

Many of the teachers and trainee teachers I have worked with have tried ChatGPT for themselves, and have found a whole range of relevant use cases: creating medium-term plans and lesson plans; identifying content to cover in a presentation; creating multi-choice quizzes; and a mark scheme that produces model answers for exam questions and even provides code for analysing pupil attainment data.

For pupils, it is already possible to see ChatGPT fulfilling some, but by no means all, of the roles of a teacher or teaching assistant. Lev Vygotsky wrote about learning happening in the zone of proximal development, where the learner is just beyond the point where they can do something on their own, but not so far beyond that they can't be helped by a more experienced person.

Traditionally, we would see teachers as the 'more knowledgeable other', but we have come to recognise that fellow pupils can take on this role, and we are now seeing the emergence of ChatGPT as a new kind of 'more knowledgeable other', one that can be accessed at any time, and one that can be used to help with a wide range of tasks. Under 13s can't create their own accounts for ChatGPT, and those between 13 and 18 should only do so with parental consent.

At the moment, ChatGPT has a text-based interface, so pupils' literacy skills need to be at a good level before it is accessible to them, although it can be used in

combination with text to speech and speech to text accessibility features built in to modern operating systems.

While it is easy enough for pupils to get started using Chat GPT for themselves, making effective use of it is a skill that can be both taught and learnt. Using Chat GPT well is about coming up with good 'prompts' for the AI – the information the pupils provide it with or more typically the question you ask it. There is a parallel here with our role as educators – our learners learn best when we ask good questions or provide a good stimulus as a starting point for their response, and indeed some of the best interactions with Chat GPT can have something in common with great dialogues between teachers and their pupils.

Help with homework

Chat GPT is very good at coming up with answers to most homework questions. It will provide answers to comprehension questions if given the source text, or write to a given length on most topics. Crafting the prompt so that it includes information given in the lesson or from the textbook can help provide an answer closer to what might be expected. It is also pretty good at creative writing, including poetry. Pupils can ask it to rewrite text in the style of say, an eleven year old, or more usefully to explain or elaborate particular points. It is less good at maths, at least at the time of writing, but I am sure this will get better soon.

I worry about pupils using it to do their work for them, as this seems to defeat the educational objective of the task. Teaching pupils how they can use Chat GPT to help them learn seems more useful – it is good at suggesting ideas for an essay or a story, and it can help make improvements to something that pupils have already written. It is also good at explaining something, and these explanations can be phrased in language appropriate for younger readers, or expanded. It can also create revision or practice questions on topics, and will engage in a Socratic dialogue if asked to.

Ethical issues

Pupils' use of Chat GPT raises ethical issues – the primary and secondary pupils I have spoken to about it are generally clear that it is fine to ask it to explain things,

to ask it for ideas, or to get help improving something they have written, but it crosses an ethical line to pass off its work as their own. This is pretty much the same way as they would think about advice from their peers, parents or tutors.

Arthur C. Clarke suggested that 'any teacher who can be replaced by a machine, should be'. I think and hope that we are a long way from that, but for a motivated, literate and connected learner, Chat GPT can be a powerful tool for learning. As teachers, we need to be aware of how pupils can and will use these systems, and offer our own 'prompts' to pupils to help them use them positively.

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

Importance of Computing in the Curriculum

By Amy Cartwright, Head of Computing and Head of Digital Innovation and Learning at Ibstock Place School.

There are probably few people who will argue against the need for Computing to be taught in secondary schools. We have already had that discussion, we have been there, done that and got the t-shirt. We understand that the future workplace will require people to be good with computers. We know that there will be many jobs available for highly skilled technologists. And we know that rapid advancements in industry robotics are already reducing the need for human labour.

All of this is old news. Clearly, young people need to be confident and skilled when using technology. So, the simplest conclusion that we can arrive at is that we need to give more importance to Computing in education. Frustratingly, it doesn't seem to be that simple.

In most secondary schools, Computing is a specialist subject. Learners are given a small taste and then required to make a choice as to whether they would like to continue to study it. Already this is problematic. Packed timetables, combined with the breadth of the subject, mean that there isn't time for teachers to provide a comprehensive and engaging overview before the selection process begins. Because of these time constraints, teachers are forced into squeezing large and complex concepts into five-week modules. We certainly wouldn't expect a pupil to be able to write in French after five, one-hour lessons – and it's definitely not enough time to teach a pupil how to code! Inevitably, learners struggle to grasp the basics and start to think of it as a 'difficult' subject, decreasing the likelihood of them wanting to continue.

Life in the real world

I don't envy the team responsible for producing a school's timetable. It's easy to demand more time, justifying your need over all the other subjects is the hard part. I'm not going to wage war against other subjects, as it's not productive. There is little point going to battle to try and prove which is the superior subject when we already know that a wide and varied education is vitally important. However, it is equally as important that we ensure that the varied curriculum pupils receive is preparing them for life in the real world.

'But my child doesn't want to be a Computer Scientist'. Well, this is a fair point. Admittedly, I am one of those people who thinks that coding should be a skill that is

given as much importance as reading and basic maths. But that's because I am biased. The reality is that Computing is more than coding. This is something that is frequently misunderstood by parents, young people and sometimes even schools. Coding isn't the crux of this argument.

In Key Stage three, Computing lessons typically teach skills across IT, Digital Media, Digital Literacy and Computer Science. We are already in world where poor digital literacy is a huge hinderance in the job market. In some schools, if Computing is not picked as an option, learners will have a very limited access to computers throughout the rest of their secondary education. Not only will this have an impact on their readiness for the workplace, but it also raises serious concerns around the perpetuation of a digital divide.

The best employees

With the emergence of tools like ChatGPT, future employers will look for candidates who can understand how to make best use of artificial intelligence to enhance their own abilities. In addition to having relevant knowledge, the best employees will be able to demonstrate an aptitude for independent and original thought. When you have a computer program that can regurgitate facts, write in prose, and perform complex calculations you are going to need people who understand how it is doing this. That doesn't mean just coders, but people who understand the success rate, how to get meaningful responses and the potential risks of using such technology. Young people who do not have an adequate education in Computing will be at a significant disadvantage as these tools will remain a somewhat impenetrable 'black box'.

'But I am very concerned about increased screen time'. I firmly believe that the screen time argument centres entirely around whether the screen time is purposeful. Surely, having learners increase their screen time within an educational setting is not really the issue. I would even go as far as to say that teaching young people how to interact with devices in a more meaningful way could be a big step towards tackling the mindless scrolling habits parents are rightfully concerned about.

A shift in mindset

I know that this is a familiar conversation and that I have barely scratched the surface. I also know that I am likely preaching to the converted, but it is something that we must keep talking about. We need to keep asking ourselves why Computing is still considered a special skill and not an essential one? Perhaps it is time for us to start to consider Computing among the core subjects in the curriculum?

The fact is that if we genuinely do want all learners to be adequately prepared for the future workforce there will need to be a national shift in mindset towards computing education. I don't think I have the power or the experience to determine what that shift would look like, but it is definitely a conversation I would like to be a part of.
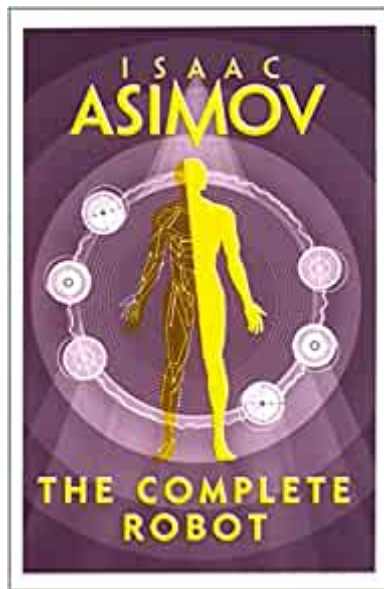

Amy Cartwright

Amy Cartwright, Head of Computing and Head of Digital Innovation and Learning at Ibstock Place School.

Further reading and useful links
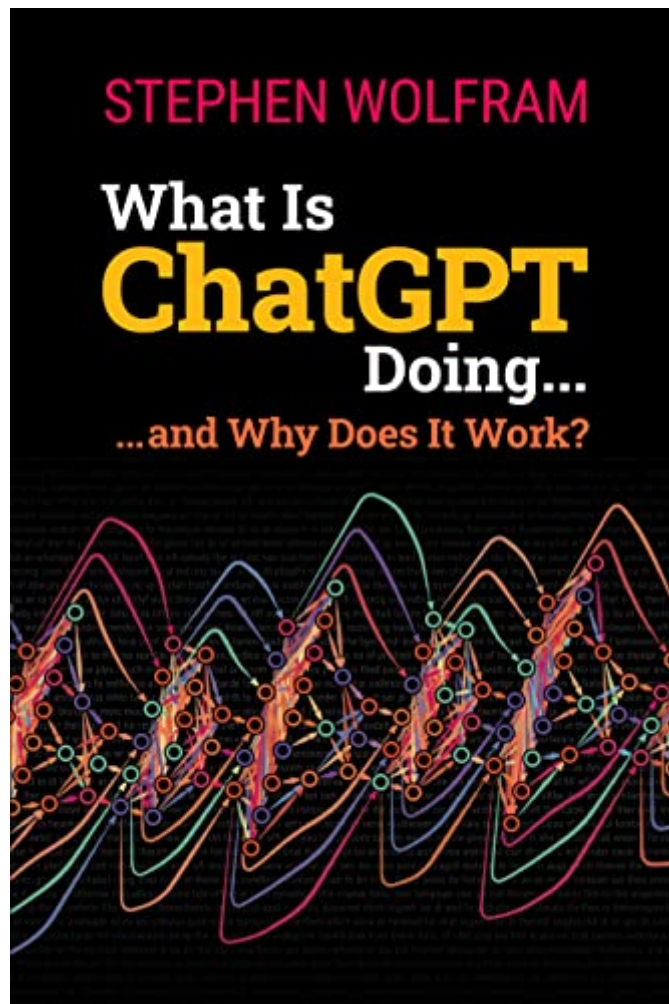
Miles Berry, Professor of Computing Education at the University of Roehampton recommends *Wolfram, S (2023) What Is ChatGPT Doing...and Why Does It Work? Wolfram Research Inc.): "Stephen Wolfram created Mathematica back in 1988, and 35 years on it remains the leading platform for doing mathematical work 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.*

Amy Cartwright, *Head of Computing and Head of Digital Innovation and Learning at Ibstock Place School, recommends Isaac Asinov's "The Complete Robot". Perfect for anyone unsure of the potential future impact of technology*

Our thanks also to Peter Marshman, CEO - digit<all> for highlighting some useful links for you to explore:

- Free Primary Computing CPD
- Free Secondary Computing CPD
- Fifi the Llama coding
- Coding activity with a focus on climate
- Girls football coding, inspired by the Lionesses
- Penguin ice skating coding activity

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