Call for Evidence – Computing in Schools

My background:

I am currently an ICT and Computing teacher at a large state secondary school in West Sussex. I have been teaching for 7 years and trained as an ICT teacher at Brighton University (PGCE). Before this I worked for 4 years as an IT management consultant for PricewaterhouseCoopers. My academic background was that I completed an undergraduate degree in Philosophy with Artificial Intelligence, followed by a MSc in Knowledge Based Systems at the University of Sussex. I feel it is important to explain my background to this level of detail to assist with the understanding of the views that I will express.

Definition of terms:

The following definitions are my personal understanding and use of these terms.

IT – the term business and industry use to describe the infrastructure, services, systems, etc etc that utitlise computer technology. If you work with computers you are an IT professional not a "computing"professional. People who work in IT may simply use computers, or they may design and make new systems, whether hardware or software based or a combination of both.

ICT – a subject taught in schools. I feel that this particular term is not used or understood by industry or perhaps even universities. ICT focusses on the correct use of technology to communicate effectively, and the skills needed to do this, rather than how the technology works or the logic behind it.

Computing – a subject taught in schools, colleges and universities, distinct and separate to ICT. It is a fully fledged academic subject with a distinct body of knowledge.

Computer Science – the same as Computing, but I feel that this term is used more by universities to describe this academic discipline. I would also use the term computer scientist to refer to someone who works in fields that involve research and development in the field of computing.

Responses to the questions in the Call for Evidence

1. Is computing a discipline, in the same way that mathematics, physics, chemistry are?

Yes! There are distinct areas of knowledge that fall only within the area of computing. Aspects of other subjects are necessary to understand some computing concepts, in the same way that knowledge of Maths is necessary to understand some parts of Physics. This does not mean that Maths and Physics are the same discipline.

2. Is programming a fundamental form of literacy for the modern age?

No, I don't feel that it is. However I feel that it is extremely important that a significant number of people are able to learn programming so that the field of computer science can be

progressed. I think that this possibility should be available to pupils in secondary schools if they are interested at Key Stage 4 and 5. I also feel that some elements should be made available to pupils at Key Stage 2 and 3 so that they can develop their interest in this area.

3. What purpose should the teaching of ICT and Computing in schools serve?

ICT should teach ALL pupils about how to use technology effectively as well as how to be safe and lawful when using technology. It should also teach them how to be resilient, persistent and curious about new technologies. I feel the being literate in ICT is fundamental to participation in modern society. There are a huge number of advantages available to people who can use technology efficiently in their field of work, or in their home life. Being able to find and process information is an extremely useful life skill – it enables people to access all other areas of knowledge.

4. Is the teaching of ICT (and accompanying qualifications, such as ICT GCSE) fit for purpose for all students? What should be done to address this?

I have only taught the GCSE course offered by Edexcel. I feel that this particular qualification is not at all suitable for preparing pupils for an ICT literate life. There is a huge emphasis on documenting every aspect of the coursework that pupils produce, and these projects are organised as a traditional systems life cycle type project. There is no flexibility for pupils to learn about other project methodologies and use these in their coursework. Two of the four projects have to be about spreadsheets and databases – which in most schools means Excel and Access. This makes the course very PC and Microsoft focussed. There is an inevitable feeling that you are training pupils to become future office drones that can use the most common programs effectively. The pupils can become bored and disinterested in the repetitive coursework projects.

The theory content for the course is an odd mish mash of topics, with some aspects of computer science introduced (e.g. binary, control/sequencing of instructions) but not explored properly or in a proper context.

The theory content also lags behind reality – most pupils have never used a floppy disk but they are still being asked about them!

One of the things that has been done to try and address this is the introduction of a myriad of “applied” or “vocational” or “digital” qualifications. These are normally 100% practical – there is no theory taught and no written exam (some have a practical exam). These qualifications focus on learning skills and producing a product to match requirements. These types of qualification include:

AiDA/DiDA from Edexcel
OCR Nationals from OCR
Applied GCSE from Edexcel/OCR/WJEC(?)

Of all of these, I have found the OCR Nationals to be the most interesting and flexible course, allow teachers to deliver a wholly practical course that does actually prepare pupils for future

computer use. There are a large number of optional units to choose from, as well as reduction in the amount of intentional and unintentional reliance on a specific brand of software.

In my school, we have actually made the decision to **phase out GCSE ICT and A level ICT**. We are now offering only the OCR Nationals course at KS4, or the new GCSE Computing (pilot) course from OCR. If pupils don't opt for either of these, they do a compulsory shorter version of the OCR Nationals course in 1 lesson a week.

At A level, we now only offer the Applied ICT (single or double award) from Edexcel or Computing from OCR. I feel that this gives a clear distinction between the field of ICT which is about equipping **every** pupil with useful skills, as opposed to Computing which is for some pupils to pursue if they have a specific interest in it, at an age where it is appropriate for them to choose.

5. Is computing and ICT best 'taught' in classrooms or 'learnt' by other means? How do learners learn computing and ICT skills?

Computing definitely is best taught in a classroom context, to allow for pupils to be challenged and stretched, and less able pupils to be supported in their learning. I also believe that ICT should be taught to pupils. There is a misapprehension that because young people use technology a lot, they must be able to use it well. This is very often not the case! When left to pick up ICT skills on their own, pupils tend to only pick up what they need to know in order to do the particular activities they are interested in, and often don't explore beyond this. They also are not encouraged to be efficient in how they use technology. Some children will be able to do this, as they may be more able, and some children may also be able to be incredibly creative and innovative. However some children are not, ***but could be***, if they had direction and guidance from a teacher. I also feel that the ability to explore technology outside of school depends far too much on how wealthy the child's family is. Poorer pupils with limited access to technology would be very much disadvantaged if ICT was not offered in a school setting – it can level the playing field.

6. What motivates students to study computing? Is it what they learn in school or something else?

This is an interesting question. Those who have chosen to study computing at my school have had experiences of computing during KS3 and so are aware of what it is. However a lot of them had a pre-existing interest due to an existing curiosity about computer systems. This often begins with an exploration of their home PC, such as upgrading hardware components and exploring some of the free software available for gaming related programming. They are normally children who are curious about the world around them and want to know "how things work" – I get inundated with questions about all kinds of computer related topics when I am teaching my GCSE and A level students.

7. How is computing presented at school, and is there a variation between schools? Why?

There is a huge variation between how different schools present computing. This depends on many factors including:

- the experience, qualifications and backgrounds of the teaching staff
- the personal preferences and (potential) prejudices of teaching staff
- the priorities of the senior leadership
- the exam boards and specifications that are offered
- the technology available in the school (and how often this can be updated or changed)
- the reliability of the available technology
- the time allocated to teaching computing
- the understanding of the difference between ICT and computing

8. Who is teaching computing, and what qualifications do they hold? Are teachers sufficiently supported with subject-specific CPD? Are there enough specialist teachers? Why do they leave/join the profession? What are the barriers to improving the situation?

It is not possible to train as a "Computing" teacher when doing a PGCE or similar. You train as an ICT teacher, and then move into teaching Computing if the school you work at offers it or is prepared to change and offer it. It is also only relatively recently that ICT was available as a subject area to train in. Older teachers will have trained in other subjects and hold **no** formal ICT or Computing qualifications at all. These teachers moved into teaching ICT/Computing when the subject was in its infancy, and can come from a variety of backgrounds. Frequently they are maths, DT, science or geography teachers. For some reason that I don't understand I have also encountered a lot of ex-PE teachers doing ICT! This causes a problem in that head of department tend to be these older teachers, who are not trained in ICT or computing, and so may not fully understand the difference or be interested in offering both subjects. However, a reasonable number of teachers have a Computer Science or related degree, and/or have worked in the IT industry before becoming a teacher. I am lucky in that within my department there is another teacher who has a Computer Science degree and who can program, so we can teach all of the computing classes between us.

I have never seen or been on a CPD course that has been specifically for computing. I have been on lots of courses offered by the exam boards which are specifically about their qualifications, and attendance at these courses is necessary for successful delivery. The only activities that I have been on in this area have been events organised by CAS (Computing at School), such as their annual conference where there are some sessions about particular computing topics.

I don't feel that there are enough specialist teachers that could successfully teach computing. The reason for this is that the universities who train ICT teachers don't require much previous experience or qualifications in Computing. For example, Brighton University require a degree, or equivalent, directly relevant to the subject specialism (ICT). However, whether or not the degree is relevant is at the discretion of the course supervisor. There is a huge variety of degrees that could be interpreted as relevant, and there is a huge difference between the content of degrees described as Information Technology compared to those described as Computer Science. There is no requirement to be able to program. Most of the people on my PGCE course (7 years ago) were not able to program.

I feel it would be very difficult for an ICT teacher who has no ICT/Computing qualifications to learn enough Computing theory and programming skills whilst also teaching full time. It would take a long time, and they would have to start teaching the subject gradually as their knowledge

grew. This would also totally depend on each individual teacher to drive their own learning and teach themselves.

It would be great if it were possible to train as a Computing teacher (PGCE or BEd), but I don't know if teacher training providers have the ability or inclination to offer this.

9. Why do some universities prefer their undergraduate applicants to have studied mathematics rather than computing at A-level?

Because there is a proven correlation between mathematical ability and computing ability. Also, the teaching of maths in schools is standardised and consistent so universities know what they are getting – if you have an A in maths it is fairly clear what you know and what you don't. As the delivery of computing is so varied in style and in quality I feel that universities can't rely on students all being taught the same and to the same standard. This means that the first year of the course must standardise this variety and bring all the students to the same point. If it could be guaranteed that pupils would have a well-defined body of knowledge that the universities have had input into, then perhaps this situation would change.

10. What are the perceptions of computing and ICT amongst learners, teachers and headteachers? How can information, advice and guidance be improved?

One aspect that seriously concerns me is the widespread gender imbalance within Computing. We rarely have girls opting for Computing at A level – one girl opts for it every 2 or 3 years roughly. The new GCSE Computing that we have introduced has 3 girls out of 38 pupils. I am female, and I am the Computing coordinator at my school, and I do all the talks about the Computing options. This doesn't seem to put the boys off, but neither does seem to be having any impact on whether girls choose computing. I absolutely don't want to consider the idea of pandering to gender stereotyping and making computing "pink and fluffy" which seems to be some people's idea of how to appeal to girls. I want to understand why girls don't feel it is for them. I also don't believe that there is an inherent gender bias – that girls' brains are by definition not suited for computing. I believe this is a learnt and acquired attitude, and that this could be avoided. I wish I knew how!

Regarding ICT, the attitude seems to me to be ambivalent. It is not a subject that most children are excited about at GCSE level, although most enjoy it at KS3. It can be perceived as dull, especially if it is delivered by non-ICT teachers who don't really understand the subject themselves. It can be delivered in a very structured and guided fashion, which focuses on the outcome alone. The worst example of this is where pupils follow rigid online courses like the ECDL (which are not really aimed at school pupils), almost as a self-study activity.

Pupils who study Computing are generally positive and enthusiastic about the subject. All pupils seem to enjoy the programming aspects of the course, and many thrive on the challenge of working out a solution to a given problem. Most pupils who take it at A level go on to do the subject, in some form, at university. When pupils are exposed to computing at KS3 as part of the ICT curriculum they also seem to enjoy it. We use Scratch in KS3 specifically because it is accessible and fun, whilst also allowing pupils to learn some important computing concepts.

I feel there is a problem within schools that ICT is not valued by other (non ICT) teachers. As they themselves know little about IT, they perceive ICT to be simply about producing something (like a powerpoint presentation) on the computer, and that the pupils don't really need to be taught how to use the computers as they are all much better at using computers than the teaching staff! I have actually had this comment said to me on several occasions. I can categorically state that there is not a single pupil in my school who this would apply to! Teachers who have this attitude often have an associated attitude that teaching ICT is "easy" as the pupils already know what they are doing, and the ICT teacher is somehow seen as simply supervising the pupils.

Furthermore, all teachers are expected to use ICT in the course of delivering their subjects, but often the ICT teachers are not involved in what this means. Pupils can often get a wide variety of ICT use in their non-ICT lessons, which may not support what the ICT teachers are trying to deliver.

There is a further issue, in that due to lack of understanding, most teachers don't seem to realise the ICT and Computing are very different. This seems to get worse the more senior a teacher is. Teachers can use the terms interchangeably without realising their mistake. This is confusing for pupils. I fell that the more that Computing is discussed as a separate subject by universities, government bodies, exam boards and so on, the less confusion there will be amongst teachers. All of us need to use the same explanations and definitions of each subject to aid clarity.

11. Are these issues unique to the UK?

I have no experience of other education systems so cannot comment on this unfortunately.

12. What can universities do to improve the situation?

Get more involved with schools and the exam boards. There needs to be a better correlation between A level and university computing – are we equipping pupils with the skills the universities want? I would also like to be able to have more opportunities for speakers to come into schools, or to take pupils to activities at universities.

13. Is there a case for curriculum reform? Is this the barrier?

I do feel that the vast range of courses offered at KS4 is confusing for pupils, parents, industry and universities, and could do with paring down and rationalising. The KS3 ICT curriculum was recently adjusted, and is already an improvement. Perhaps it could be rebranded as ICT & Computing, and explicitly contain some fundamental computing concepts. At the moment, the curriculum allows you to cover computing topics but doesn't do so in a rigorous and clear fashion. The actual deliver varies widely between schools.

My vision for the subject area is for pupils to study ICT & Computing at KS3 as a requirement, with the focus being on becoming ICT-literate and resilient whilst also exposing all pupils to computing ideas. At KS4 they should then be able to choose to specialise in Computing, or continue with ICT as an option if they enjoy it. If neither of these options interests them, then pupils should have to continue with a minimum compulsory ICT course to ensure full ICT

literacy. The course offered for this compulsory ICT should be appropriate, interesting, up to date, flexible and not software or platform specific.

14. Is there a need for an increased recognition of ICT and computing as part of the T in STEM, through representation in STEM forums and increased funding?

YES! This would be fantastic as STEM is well recognised in schools, but the Computing aspects tend to be pushed into Maths or Design Technology, bypassing the ICT/Computing teachers altogether. The STEM activities and opportunities tend to be science or engineering focussed, and I don't feel that anyone in the STEM organisation is specifically concerned with Computing. I don't understand why as computer science is as important as engineering, maths, or other technology subjects. We have a large number of people employed in the field of IT/Computing in the UK – why don't we recognise and value this?

15. What happens if we do nothing?

The situation may get better, worse or stay the same on its own. However if we do nothing, we will certainly have no impact or control over a positive outcome! As a body of computing professionals we should be concerned with the future of our subject.