# My work among the keyboards: Remembering the early use of computers in the classroom.

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**Abstract.** This paper reflects on the early use of computers in school. It begins with an account of the author's own introduction to computing, while a school student himself, and his first attempts to teach computing and information technology courses. The next section of the paper describes his enthusiasm for teaching in another school and the challenge of engaging students' interest. The teaching of Logo is then described in a third section and this is followed by a section that discusses a project to promote the use of data handling with computers. The paper concludes by reflecting on: the role of computer studies in the curriculum; the romantic versus rationalist view of technology; the purpose of schools and schooling; and the unpredictability of the take-up of computing. It concludes with an appeal for schools to provide children with an opportunity to reflect on their own use of technology.

**Keywords:** computing, small programs, early career teaching

## 1 First Experiences of Computing

I first became aware of computers and computing when at secondary school. This would have been in the early 1970's. Those of us who were considered mathematically minded were invited to attend a short course, which drew on materials designed by ICL[1] to learn the rudiments of programing and get an idea about the impact of computers on society. I was a little reluctant as these classes were offered instead of sports and I was a sports enthusiast. The point I am making is that I began an engagement with computers through the study of computing. I was taught to write simple programs using, as I recall, an early version of COBOL. Our lines of code were punched on cards, the cards were sent to terminals and returned with printouts. Very often the programs did not work - two cards stuck together or the holes were not punched cleanly enough. I am not sure that really mattered, the construction of the

[1] International Computers Limited, or ICL, was an early British company engaged in the manufacture of computer hardware, computer software and computer services. It operated from 1968 until 2002.

algorithm was interesting enough in itself. As for the impact of computers on society, the set of video recordings we saw implied that there were going to be big changes in every sphere of life. You can argue that this has turned out to be the case, but on nothing like the timescale suggested to us. One scenario I remember showed patients turning to a computer to diagnose their ailments through an early kind of Artificial Intelligence software. Patients would find the process quicker and easier and they would not have to leave their house or interact with an overstretched medic. The scenario might be seen as prescient given that most of us today self-diagnose through any number of medical web sites but it had got something significantly wrong. Interaction at the computer was presented as an individualised process and the scenario had not built in our need to discuss our symptoms with each other or indeed our need to invest trust in someone, in this case a medical practitioner, who had a 'warrant' of professional expertise. I do not recall the course making a deep impression on us. However, it did invite a way of thinking about computing and the power of computing and, at the very least, it created an awareness that tasks which were being carried out 'manually' would be automatically processed in the future. This was not, however, enough for me to follow up an interest in computing and I went off in other directions.

## Becoming a teacher

After various career and determinedly non-career excursions I qualified to teach and I found myself working in three different secondary schools in the periods covering 1984 – 1989. In the first I was filling in short term for an absent teacher. I was to teach mathematics and this 'of course' involved computing. I was asked to illustrate examples of programing and, if possible, get the pupils to write a few lines of code themselves. This was not going to be easy. There were only a couple of computers (BBC ones[2]) in the whole school – one had to be rescued from a broom cupboard - not enough for any meaningful 'hands on' programing in the classroom. Rather than punching cards programs could now be recorded on cassette tapes. This was famously unreliable. As a teacher you could spend a break time loading a program for your next lesson only for it to crash at the last minute. Thankfully the computer studies course was a short one, only a lesson a week over six weeks with one group and then repeated with the next.

Within this short introductory course I was asked to involve youngsters in debates about the impact of computers on society and I had access to recordings of two or three short films produced for schools. These films had the potential to be interesting but I failed to engage the youngsters' imagination. We were back to considering

[2] As is well known the BBC 'badge' was given to a series of microcomputers and built by the Acorn Computer company to tie in with the BBC Computer Literacy Project during the 1980's. BBC computers were very popular in schools due perhaps to their reliability. They were seen as more robust too. Eventually of course schools moved over to PC and some to Apple Macintosh machines.

future scenarios. I recall one film showed a handheld machine which enabled text to be displayed digitally and which would alter the notion of a 'book'. Using this device, you could change font and font size and you could store a whole book on it, even a mini library, which you could, with difficultly, take around with you. Again, prescient but it had missed out something quite essential. Digital books did not take off until devices were affordable and truly portable and until it was possible to comfortably read from the screen in natural conditions.

After this first brief introduction to school teaching I took on my first 'proper' teaching appointment. I was again teaching some computing and I was now able to access a whole room of computers in a small local area network. I had by now a little more experience of the computing curriculum but no formal training in the subject. My subject knowledge was shaky and I tried to keep one step ahead of the syllabus. When it came to practical 'know-how' I would circulate the class, pick up a skill by observing or troubleshooting a problem with one pair of students. I could then confidently demonstrate the skill I had only just picked up to the next pair of students. I gained what I needed 'just in time'. However, I do recall one lad – Andy – asking me week after week 'when were we going to do assembly languages?'. I had little idea as to what he was talking about and had to 'gen up' furiously to prepare a lesson that bore some relation to the description of assembly languages in the textbook. The great day finally arrived when I could confidently present assembly languages as a topic and impress Andy with my knowledge. However, he was not there. I learnt that he had a troubled background and had moved home and school a lot, his family had now moved on. Someone thanked me for taking an interest in him but that was that. My view at the time was that he was a programmer with potential but let down by a stodgy curriculum and my lack of knowledge. He certainly had copied many programs from books and magazines and was an enthusiast for coding. However, looking back, I do not think he had understood the logical structure of programing and he had no more idea of an assembly language than I had or he would have seen through me straight away.

During this period I was learning my trade as a school teacher. The classes were challenging - to be fair more at the level of tiresome low-level disruption rather than any outright hostility. It was an uphill struggle to engage students in computer studies classes, particularly in issues of computer architecture. The impact on society should have been more interesting for them but it took me time to realise that what was happening in the world outside often had limited appeal. One of the scenarios we looked at in depth was at how computer algorithms were able to control and coordinate traffic light signals to speed up traffic flow. However, my students did not drive and their parents tended not to have cars and, for that matter, neither did I. The scenario washed over them. I have nothing against traffic lights and I have seen and worked with youngsters really who enjoyed working with programs such as *Flowol*[3] to set up and control simple traffic light systems. The problem lay in the lazy

[3] Flowol is described by its designers as an easy to use drag and drop approach to flow chart programing and has been widely used in UK schools.

assumption on my part that computer control was necessarily interesting *because* it was about real life – there was nothing necessary about this.

After some reflection on my lessons, I decided that I could better engage my students by turning to more immediate examples to illustrate how computers were affecting their lives. I created a module on educational technology in which they could review whatever titles I could get hold of (this was largely software developed within the Microelectronics Education Programme (MEP)[4]). I also recorded a couple of BBC television programs about information technology in schools for them. A key idea in these programs was that computers needed to be in subject classrooms rather than in specialist computer rooms, allowing technology needed to become a normal part of teaching and learning. The films also took a critical look at 'instructional technology' something later made more familiar in England and Wales in the form of Integrated Learning Systems (Wood, 1998). My module on educational software went much better, particularly the software evaluation, though it did not generate any outright enthusiasm for, or critique of, computer supported learning. Interspersed with this module I carried on with computer coding and programing. Students were able to produce simple programs in BASIC. Key for assessment was the writing up of the design, implementation, testing and evaluation process and by and large this was something students did not take easily to. However, a fair number enjoyed the work at the computer and I felt I had developed a comfortable way of working with the class which allowed me to troubleshoot and support pupils at machines and to present tips and guidance to the whole class at odd points during the lesson.

I found little use of computers around the school and perhaps this was due to lack of interest on the part of colleagues or simple lack of access. I did, however, notice that teachers of English were using word processing in some classes and the language support teachers were experimenting and enjoying working with *Developing Tray*– a text revelation package. In mathematics, which was my main subject, we used a lot of equipment: number blocks, dice and of course calculators but nothing in the way of desk top computing. I had not seen or used *Logo*. Later I got hold of a *MicroSmile* [5], a suite of programs for learning and teaching mathematics containing games, puzzles, and simple 'revelatory' scenarios. As a new teacher I was ambitious, and I wanted to challenge students to investigate mathematics not just carry out the controlled practice that the textbooks provided. My efforts met with a mixed reception. I particularly remember one child I taught, let us call him Roy. We were doing an investigation of some kind and he was having none of it: 'Why are we doing all this investigative stuff, can't we do something useful like square roots like we did with our previous teacher?'. Roy had, what I would describe without irony as, 'natural wit and

[4] The Microelectronics Education Programme ran from 1980 to 1986 in UK. Its brief was to explore and promote the use of computers in schools. MEP could be seen as a forerunner of NCET, and then Becta.

[5] For more on *MicroSmile* go to the national Archive of Educational Computing http://www.naec.org.uk/artefacts/software/micro-smile

intelligence' but he was a challenging boy, and he had made very little progress in any of his subject work. Why on earth would he find square roots useful? He would never do anything with square roots after he left school. Only now can I now see he was not asking for square roots, he wanted familiarity and order. I think if I met him today I would not be so dismissive and I hope I would understand him a lot better.

It was logical that I would turn to computers in my maths lessons. After a great deal of asking I was able to book a networked room and I set Roy's class to work on various *MicroSmile* scenarios. The students worked in pairs or threes. I tried to prompt them as I went round the room. Of course, I wanted them to focus in on the maths, but, to be honest, I was looking more than anything to change their attitudes to their learning. The use of the software kept them busy and made me feel much more comfortable in my role of teacher. In fact, I had been worried that Roy might mishandle the keyboard or disks but to my surprise he became an enthusiast for the use of computers and for me as a teacher. It was a breakthrough that meant a lot to me. On the flip side I was aware that a lot of what the students were doing was playing at the machine. In particular they were attempting to solve puzzles and problems by trial and error rather than generalising from their attempts, which was the underlying rationale for the programs[6]. When commentators say too much software is only used for motivational purposes, they are right but it is the word *only* I object to. I needed to see pupil motivation at that point in my career though the problem of motivating students does not ever go away.

In reminiscing on the use of technology I have described some of my feelings about the software and the teaching of computer studies but I have not really communicated the intensity of being a new teacher. If I looked around my school I could see mixed teaching and mixed outcomes but this did not matter. I was engrossed in my enthusiasm for the job and in awe of many of my colleagues. What struck me was the deep moral compass of the school. It had, at the time, a remarkable mix of students from different ethnic backgrounds and it sought very much to create a sense of belonging for all students and for the wider community. For example, music teachers promoted a strongly inclusive steel band, 'community' languages were taught, some post 16 teaching was open to the community and at Christmas lunches were put on for local pensioners. Many teachers spent a lot of time mentoring youngsters both informally and formally. I saw impressive 'active' tutorial work and a constant appeal to students to behave responsibly and be reasonable when considering other people. Those struggling for language or other reasons were given whatever boost to self-esteem and self-confidence was possible. I remember one girl, let us call her Shahira, an eleven-year-old who had been working with a teaching assistant in one of my mathematics classes. The assistant sent her to me to show off some work she had done. I said, 'thanks that was good, well done'. Perhaps it was a shade

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[6] These observations led me later to consider the importance of intervention when pupils work on classroom mathematical puzzles: Hammond, M. (1995) Exploring a World of Number, *Journal of Information Technology for Teacher Education*, 4, 3, 363 - 376. [A version of this paper can be accessed on line at: [http://wrap.warwick.ac.uk/]

perfunctory and Shahira looked a little disappointed. The teaching assistant picked up on this and said: “well done Shahira, this is very good, you are pleased with it? Mr Hammond is very pleased with it, shall we now show the head of the department and see if he is pleased with it?”. Shahira duly went out to show her work to the head of department and was told, with more enthusiasm than I had mustered, how well she had done. The point is that the teaching assistant understood Shahira’s fragility as a learner in a way that I did not. She would not let Shahira go until she had been convinced about the value of her work and was willing to accept that she had the capacity to learn. I know this kind of reinforcement is maddening for conservative commentators who see explicit ranking of performance as core to the work of a school and ultimately in the best interests of students themselves. However, the liberal ethos in my school was very inspiring for me and very different from my own schooling. I had never properly understood what it might be like to struggle academically or lack belief in my potential for learning and the teaching assistant had, whether intentionally or not, pointed this out to me. I thank her to this day for doing so.

The school in which I worked played an important role in the lives of all the young people, not just those that were struggling. This was demonstrated to me in the weeks leading up to the Christmas holidays. Students’ excitement mounted and with even three weeks to go I was asked ‘we are not doing a proper lesson today are we sir, it is nearly Christmas?’. This went on and on until the end of term finally came, the students went home and I imagined how pleased they would be. Leaving the school later that day I was astonished to see the same children who had been desperate for the holidays congregating around the playground. They told me they were bored at home and looking forward to coming back to school.

## Working with Logo

After two or three years I moved to another school and the story moves on apace. What is worth mentioning was that this new school gave me my first experience of using *Logo*. All students were taught to create simple programs and those that took to it were able to go on and write their own procedures and super procedures. Some students really enjoyed *Logo*, some did not, some went along with it in the same way that they went along with most things that school offered. It made no great impression on me and I was astonished later, as I became interested in educational technology as a field of study, to see how *Logo* played such a central part in the story of computing. *Logo* was about handing control to children over computing and over their learning and so many hopes for curriculum change seemed to have coalesced around its use. Papert [2], at least it seemed to me, saw children as having an intrinsic interest in problem solving and almost saw ‘debugging’ of programs as a transferable and life long skill. Through *Logo* the invitation was laid out for us to think differently about schooling. I can see Papert’s point, in fact I can see the point better now than before. Later I was more than happy to promote the use of *Logo* amongst student teachers I trained and I would explain the principles on which Logo was designed. I know

colleagues who have found the teaching of *Logo* creative and life changing [7] and I have no reason or wish to argue with them on this. However, *Logo* was very much a footnote in my story of using computers.

## Software for handling data

At the beginning of the 1990's I was unexpectedly able to work full time on a project, led by Peter Holmes, to promote the use of databases and spreadsheets for data handling. I had the best of times. I visited teachers, went on courses, collated exemplar materials and made up activities for classroom use[8]. Some, at least, of the ideas worked well in the classroom. Overall, I could see the project as part of a push for using general purpose programs in school and, in doing so, creating a 'tie in' with software, such as *Word, Excel* and *Publisher*, used in industry. One argument for general purpose programs was that students could use the same software right across the curriculum: in an ideal scenario subject teacher would be able to take students' IT skills for granted and students could reinforce and extend their knowledge of IT. As I visited schools I found computers in teaching rooms not just computing / IT rooms. I saw examples of desktop publishing and word processed text displayed on classroom walls, it looked a bright new world. I also saw some strikingly original approaches to data handling. For example, a history advisor showed me a data file of miners who had died in an accident that had taken place in a nearby coal colliery in the nineteenth century. She described setting up teams of student journalists tasked with writing up a story of the mining disaster. These teams had to interrogate the data files in order to find out who had died, how old the causalities were and how many of the dead were related to each other. They wrote up their stories on a front page simulation package – this package could be pre-set to deliver news flashes to students and provide reminders of deadlines. I was intrigued and it seemed to me that this kind of 'real life' problem solving approach, backed up by technology, was becoming mainstream.

I could see and had always seen the motivational value of technology but as my data handling project progressed I wanted to go further and understand how the software could be used to enable students to do things that would not be otherwise possible. For example, the use of software for data handling enabled children to work with authentic data - large sets of data could be searched quickly and easily and these data could be easily manipulated and visualised. Data loggers allowed data to be

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[7] I learnt this in greater depth when researching colleagues' careers in educational technology – see Hammond, M. et al (2010): *What does our Past Involvement with Computers in Education tell us?* Coventry, University of Warwick: The Association for Technology in Teacher Education. [On line at: http://www2.warwick.ac.uk/fac/soc/wie/research/centre/centre_projects/current_projects/voices/book/]

[8] For example: Hammond, M. (1993) *Handling Data with Databases and Spreadsheets*, London, Hodder and Stoughton.

collected over very short or very long time periods. Word processing allowed easy amendment of text. However my enthusiasm for general purpose programs meant that I had not noticed the passing of small programs and had missed the close link that had existed between program designers and teachers. A host of programs, including *Microsmile* or *Developing Tray*, were on the wane. And in terms of software for data handling I was aware that relational office data bases were becoming widely used in school even if they were largely unsuitable for the simple searches and graphical representation pupils needed for classroom data handling. Of course teachers could get around the use of, say, *Access* by creating templates in spreadsheets, but as soon as you start talking about getting round things with technology you are in trouble. Small database programs (I was, for example, familiar with *Key* and *Grass* as school programs) were quite suitable but largely disappeared in the following years. In a similar way the program *Model Builder*, which had been developed through classroom research into school based modelling, lost out to *Excel*.

## Reflections

The period covered in this book was a significant one for me as I was able to develop a stance on computing and the use of computers in the curriculum. I had experiences of teaching, I visited many schools early on in my career and I had acquired subject knowledge alongside a level of pedagogical expertise. I was innovative and enthusiastic about teaching even if I felt at times ineffectual and weighed down. This was an intense period for me personally coinciding with an important time in the history of computing in schools. What then had I learnt from my experiences and to what should I draw the reader's attention? Four things stand out.

Firstly, I came away feeling that the teaching of 'computer studies' was problematic - perhaps not less or more so than any other subject but claims that it held a special interest for all children at school were wrong. The teaching of programing was interesting for some, the impact of computing on society could be made interesting, but the teaching of computer architecture would always be a challenge. This left me a sceptic in regards to the teaching of computing as a specialist subject for *all* pupils. My experience of using general purpose packages would have led me to argue for a cross curricular approach to information technology and for computing to stay as a minority subject. Yet ironically I later became a tutor for training pre-service teachers with a specialism in ICT, as it became called, as a subject and this became one of the highlights of my professional career. I changed my mind on the value of ICT as a subject and valued the approach to problem solving it implied[9].

[9] In brief Information Technology became a subject in itself to address the limitations of the cross curricular approach and to provide progression in terms of data handling, modelling, communication and control. The more problem based approach set out in the IT and the later ICT curriculum was hampered by the promotion of a rather narrow, vocational assessment framework 14 -19. However I could see via my visits and the work of my student teachers that it was possible to teach an IT curriculum that had appeal to all children at least some of

Secondly, I can see that I was, and indeed I have remained, a 'rationalist' rather than a romantic in regard to the use of technology. I was aware, and I was keen to show, that the use of technology enabled students to work in ways that would not otherwise be possible, but I did not see the use of technology as turning the curriculum upside down or doing anything particularly revolutionary in how I thought about teaching and learning. Others have argued that if you put computers into school nothing would or should remain the same, but this is not how I felt. Of course, there must have been something that drew me into technology. I liked to be identified as one of the technology enthusiasts and I was one of a minority of teachers who wanted to give computers a go. I overcame difficulties such as room bookings and a lack of subject knowledge in order to do this. In my early career it never occurred to me to say 'I can't teach computing I have not been trained for that'. However, I was as likely to be inspired by colleagues who did not use technology as much as those that did. The first book I read at length about using technology in school was Olson [1]. Olson explained the importance of routines in teaching, for better or worse these were needed for the teacher to manage his or her classroom and as a new teacher I could see how important it was for me to establish routines with my students. In my view Olson had got it right, computers would be very disruptive for teachers who had already settled into routines with which they were comfortable. As it happened I could establish routines with technology and the use of computers could make the classroom a more comfortable place for me to be in. However, I was new to teaching and the use of computers was core to my role. I was not a typical case.

Thirdly, if I was a rationalist about technology I was a romantic about school. I was very influenced in how I thought about schools by my first permanent teaching appointment. This enabled me to see how schools could draw on the local community and support that community, but also transcend limitations within the community. I came to believe that schools were custodians of moral principles and had a special role in developing a sense of self-efficacy for all, including the least able and most vulnerable. Even when I felt overwhelmed and ineffective a sense of optimism about schools as institutions never left me. Sometime after reading Olson I read Papert [2] in which it was argued that schools had not changed, indeed had barely changed over the centuries, and perhaps were impervious to change as could be seen by their failure to embrace technology. This had no resonance for me. Schools had changed appreciably from what I could remember of my schooldays. Schools were offering students greater opportunities to exercise creativity and teachers were learning to be authoritative without being authoritarian, no matter how often they might fall short. I know many people will, with good reason, disagree with me here and I know much better today how schools are compromised by the wider social structures in which they operate. I know how the work of schools in most educational systems has been distorted by top down change and rapid shifts of policy. However, when I think of

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the time. I discuss this in more detail in: Hammond M. (2004) The peculiarities of teaching ICT as a subject: a study of trainee and new ICT teachers in secondary schools, *Technology, Pedagogy and Education*, 13,1, 29 - 42.

schools I still feel optimistic and I have felt it a privilege to spend most of professional career working with teachers and student teachers.

Finally, from my work with computers I learnt that the take-up of technology is, to some extent at least, unpredictable. I had presented scenarios based on the use of technology but I could see that those who predict the future often get it wrong. If it is assumed that something will happen just because it has now become technically possible some quite basic economic, psychological or sociological dimensions, let alone financial and production issues, will be left out. Computers, it was predicted, would offer us less intensive working lives when the opposite seems to have happened, computers would offer a more individualised and differentiated society but new media seems to have strengthened not weakened social bonds. I think it is important for us to present the future as uncertain and to show we can have a say in how the future pans out. Schools can help here. It is not the job of schools to mimic the use of technology in the home or indeed in the world outside or be cheerleaders for the use of technology. Rather the job of the school is to notice changes and to provide a window for reflection on those changes.

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