

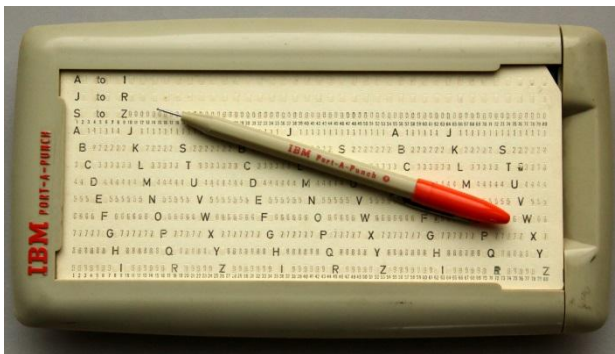
Computing in Schools - The Early Years

“It did not start with the BBC Micro!”

While in the sixth form I decided that I wanted to be a secondary teacher of Physics and Maths. I decided on the teacher training route and studied at Portsmouth Teacher Training College from 1963 to 1966 and obtained a post at a Secondary school in Southampton teaching 50:50 maths and science. This school had three science labs; Chemistry, Biology and Physics and no technicians. During the first year I always seemed to be in the wrong lab for the topic I was teaching and had to rush about fetching and returning apparatus. In the second year I changed to full time maths. This was the age when you needed a set of ‘Log Tables’ or a slide rule to speed up difficult calculations.



At this time the local Technical College obtained an IBM 1130 computer (8K of 16 bit core storage) and dedicated some of its time to supporting schools. Free courses were offered to maths teachers in learning to program. The initial course used City and Guilds 319 mnemonic code. This was an artificial assembly language, just for teaching and examining. I think the institution had to simulate the imaginary machine on their available hardware. We punched the programs into the first few columns of an 80 column Hollerith card and on the first pass the computer punched the translated ‘machine code’ into the other end of the card. On the second pass the computer read the ‘machine code’ and simulated the instructions. Output was to a large line printer on the wide white and green lined paper with holes down the sides. This was all very exciting at the time.



Transferring our newly acquired knowledge to the classroom was a different matter. My school was more than four miles from the computer and card punches were enormous, heavy machines and very expensive. Even simple hand punches were too expensive for schools. The only affordable solution was to use pre-punched cards. These cards had the even columns gently pre-punched so that all the chads were cut through the card at the sides but just held in place at their corners. The chads could be pushed out with a blunt pointed tool while held in an IBM Port-a-Punch. The system was designed to collect machine readable data in the field. The user had to know the code for each character but the cards could be purchased with the pattern for the letters and numbers printed on the card. The ‘special characters’ such as = + / etc. had to be memorised. Even Port-a-Punches were too expensive for schools. I had one but the school students had to use a different technique.

The required statement was first written at the top on the card with a single character in each even column. The code was then made machine readable with a ball point pen. The tip of the pen was pressed onto a chad which needed to be removed and the card gently lifted to remove the chad. With practice students soon became adapt with the technique. The cleaners hated them – tiny chads all over the floor.

The small piles of cards making up each program were topped and tailed with coloured pre-punched batch system cards and student ID cards. After school I would drive to the Technical College on my Lambretta and run the pile of cards through the computer, collect the printed output, separate the individual student's cards and match them to the results, holding them together with rubber bands. (No IT technicians in the late 60s!)

Initially 'Computing' was not a separate subject. It was taught as a short module in Maths lessons or as a club activity.

The following year the college offered free teacher training in FORTRAN VI and the schools using the system quickly transferred to this. IBM had a research centre just outside Southampton at Hursley, packed full of wonderful up-to-date computers (as seen in spy films at the time) and we were lucky enough to get a few school visits to see what was going on at the cutting edge. IBM also had a wonderful service for schools and we could order copies of IBM manuals and other publications which were supplied free of charge. Flowcharting templates were supplied at cost.

Locally other free courses were given for teachers in COBOL and PL1 but what we really wanted was BASIC.

Imagine our delight when a notice went up in the computer centre announcing that they had just received a BASIC compiler from IBM. It was quickly installed and tried out. Unfortunately it had come from Brazil and all the error messages were in Portuguese! There were only about 30 possible flagged errors and most were obvious, or a missing extra chad, so we quickly moved to BASIC as it could be taught to a much wider range of students at an earlier age.

Back then school inspectors ran free residential courses for teachers. I was able to go on a maths course about computation. I had used mechanical calculators during teacher training. They were full of gears and you set the numbers on vertical dials and turned the handle many times to get results. They were expensive, delicate and difficult to use. This course introduced us to 'electronic' calculators. The 'Litton' at £35 each was recommended. It had $+ - \times =$, numeric keys and a single memory besides the accumulator. Another course was on Computing at Salford Polytechnic, I think. They had an old General Electric DEUCE Computer (*Digital Electronic Universal Computing Engine*). It had more than a thousand of valves, mercury delay lines and a magnet drum store. We used Alphacode to program it from 5-hole paper tape. This machine had its own power substation at one end and a cooling plant at the other. The engineer came in at 6 am each morning to turn it on, check and replace blown thermionic valves. It was usually working by 8 am. This was great fun.

At school input was still by pre-punched cards and the students used single letter variable names so that cards from previous programs could be re-used to save time. Programs were designed using flowcharts, written on coding sheets, transferred to pre-punched cards by the students and run by me each evening at the Technical College on my way home. A little later, in 1972, I was looking for promotion and obtained a post in Cambridgeshire as Head of Maths and Computing at a Community College with a Teletype, a modem link to Cambridge College of Arts and Technology (CCAT) and Computing as an examination subject in the curriculum.



At my new school I had a secretary who punched the students' coding sheets onto 8-hole punched paper tape. These programs were sent via the huge modem to CCAT while the results from the previous day were printed out on the teletype roll – like the football results on Saturday TV. I think the

modem worked at 110 baud. (My Raspberry Pi talks to my Arduino at 115,200 baud!) The computer processing the tapes was another IBM 1130 so the languages were initially the same. This was later upgraded to a Data General computer running newer versions of BASIC and FORTRAN with improved file handling.

All students were now able to try programming in the lower school during maths lessons and those interested could opt for an examination in Computer Studies. An x/y plotter was added to the computer at CCAT and we were able to produce graphs and charts which were posted back with a one day delay.

Our next upgrade in facilities was the purchase of a Commodore PET in 1978 to provide a better hands-on experience, and the opportunity for students to edit, fix and modify programs locally. I managed to purchase an interface box from the US to connect the teletype to the PET so that it could be used as a printer. I then wrote a batch a processing program in PET BASIC to read student programs, punched by my secretary, from the paper-tape reader a character at a time and 'POKE' them into the keyboard buffer of the PET. My program used lines numbered below 99 and the student program could start from line 100 upwards. This allowed rapid input of the new program, a quick edit by the student until it ran correctly and output to the printer of the corrected program (listing and results). The student program was then deleted and the next one input. This system greatly improved the throughput of students' work and reduced the delay between first draft to a correctly working program.

About this time I decided to get an OU degree with modules in science, maths and computing. PDP-8 machine code was included in one module.

In the late 70s schools in an area worked together to produce local CSE examinations, helped each other develop syllabuses, teaching materials, examination papers and swapped hardware information and skills. As Computing developed as a subject, schools realised they needed more keyboards in a classroom. I was working in the North West Cambridgeshire area and locally we decided that using the Ohio Scientific Challenger 1P was the way forward.



They were fairly inexpensive, reliable, had a tough case, contained a useful BASIC on ROM with block graphics, could use old TVs for the screen, cheap tape recorders for backing storage and they could share a teletype printer via simple cabling and a rotary switch with RS232 communication. We even had progression for students to the Wisbech Technical College who had an early network system with a shared disc drive! Several secondary schools in the area adopted this setup. These machines could cope with multiple cassette recorders so you could develop programs to update a serial master tape from a transaction tape to a new master tape. Of course you had to handle all the end-of-field, end-of-record, end-of-block and end-of-file markers yourself. A great feeling when you got it to work.

In 1981 we heard from the county IT inspector that Acorn would be bringing out a new 6502 computer and that a team of teacher trainers would be needed to provide help and support as they were rolled to all schools, including primaries in the county. (In Cambridgeshire a 380Z was not really an option!). I became a member of the team and was one of the first in the country to get my hands on a BBC model B. We gave demonstrations, sorted out problems, calmed fears, created worksheets, wrote 'educational' programs and useful functions for incorporation into other applications. My contribution was a screen dump program for the Mode 7 screen to an Epson dot-matrix printer which was

published in one of the early BBC Computer magazines. (I think it was BEEBUG.) I was also given the task of creating a program called 'COINS' to aid the teaching of money in primary schools. It had a special keyboard plugged into the user-port at the back of the machine to which real coins could be stuck with Bluetack, if you trusted the pupils, or a thin printed overlay with pictures of the coins if you did not. Other members of the team wrote screen dumps for the other modes or developed hardware timing gates with appropriate code for physics experiments. The royalties from my program paid for my own model B, colour monitor and disc drive.

At the time the disc drive became available with the DFS upgrade I moved to a full time Computing post in a 14-19 Leicestershire Community College bringing with me the first BBC B+ with disc drive to that county. A teacher's contact hours at a Community College could be divided between normal school hours and adult evening classes. You could teach an evening class on one day and then arrive at the start of period 3 or leave at lunchtime on another day. With the introduction of the BBC Micro computing related evening classes took off and I could have taught them four nights a week. At this school I started teaching 'A' level Computer Science with some very talented students. As club activities we built a light seeking stepper motor driven tethered buggy, a voice operated French toy crane and graphical 2D digitiser. We also expanded our computer languages into 6502 assembler, LISP and Pascal and used the graphics extension ROMs as they became available.

At this time I was offered the chance to study for an MSc in Computer Education at Loughborough University. For my dissertation I wrote a graphical program on the BBC to demonstrate the Fetch/Execute cycle in operation which could also be run at faster speed to execute simple mnemonic assembler programs based on C&G 319.

At this time there was an increasing local demand for computer classes in word-processing as secretaries wanted to upgrade their typing skills and companies wanted computer literate staff. Like most colleges we invested in a network of PCs, ours was from RM, mainly for other subject areas, but we also bought a few Atari STs for Computer Science students and club activities. The supplied Atari BASIC was terrible but Highsoft provided excellent well-structured BASIC and Pascal compilers. The graphical capabilities were also very good.



At this point the opportunity to program computers disappeared for most students as CLAIT and similar schemes came to the fore. I was able to continue teaching programming in the sixth form with Computing at A level and GNVQ Computer Studies. Microsoft Visual BASIC modules and Excel macros in VBA kept programming alive while the 'Upgrade computer hardware' module interested many students. I retired in 2005.

At last computing is getting back to its roots with the advent of the Raspberry Pi supporting programming with Scratch, FUZE BASIC and Python. Arduinos and the Pi's GPIO port are creating a renewed interest in hardware projects and Robotics. Forty eight years after writing my first program I still enjoy writing code, getting my Pis and Arduinos talking to each other, creating new projects and writing short pieces for MagPi magazine. I enjoy the buzz at Raspberry Jams and contribute to forums. It's just as exciting as when I started programming back in 1967.

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