Educational Computers in New Zealand Schools: 1977 to 1983

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Abstract

New Zealand has always been a technologically advanced country. With its relatively small size and population, New Zealand accepts new technology rapidly. In late 1977, personal computers finally became available to the public and to schools. The opportunity for the Government to provide schools with clear guidance on purchasing and use of computers, both for teaching purposes and for students to learn to use computers was delayed by a lack of focus and understanding for several years. Two New Zealand academics recognised this opportunity and produced two computers in 1981 designed for education, the Poly series of computers and the Aamber Pegasus. This paper examines their place in New Zealand history and in the context of other country's approaches to computers in education, particularly in the years 1977 to 1983. A brief discussion follows of New Zealand designed computer peripherals for the visually impaired that contributed significant technology for this community.

Keywords: New Zealand education, school computing, Poly computer, Aamber Pegasus, visually impaired computing

Introduction

NZ can trace its history of computing and development of its own mechanical 'computers' to 1891 where the 'Lightening Insurance Computer' was advertised for sale in the Evening Post newspaper as 'a mechanical apparatus, for which the ordinary calculations required for insurance purposes can be made almost instantaneously without mental effort or the use of pencil and paper' [17, 28]. Like many New Zealand technologies of the time this was a locally designed and manufactured device. The isolation of New Zealand, primarily from England, made imports prohibitively expensive, and the local culture prided itself on ingenuity and self-sufficiency. This machine was invented by Mr. J. B Poynter and patented in England and the other British colonies. Users described it as being 'remarkably accurate, to the point where it was reportedly being considered for use during the New South Wales census of 1891' [28]. In 1928, Leslie Comrie, born in Auckland and who had completed a BA and MA at the University of New Zealand, wrote 'On the Construction of Tables by Interpolation' [10]. This article described how punched cards could be used for analysing scientific data and Comrie is recognized as the first person in the world to use and promote the use of punched card technology for scientific data analysis.

Whilst these very early devices were

mechanical and not electronic, the advantages of utilising devices for laborious or complex tasks were quickly recognised. Whilst other countries also developed this type of mechanical technology, it tended to be expensive, difficult to transport and often not suitable for the very specific tasks it was needed for, such as farming and agriculture. When electronic computers became available in the early 1950s, the New Zealand Government became increasingly aware that computers would form an integral part of government and organizational information processing.

New Zealand is located far from 'Mother England', and as such became increasingly isolated from the historical influences of the 'Mother Country' finding its own way with much greater independence after 1945. By 1960, NZ was much more established as a country choosing to do things 'their way' and this was being increasingly felt in education, particularly in New Zealand schools.

In the 1960s, the New Zealand Government undertook purchasing of computers for departments such as Treasury in 1960 [6] followed by Inland Revenue and the Department of Scientific and Industrial Research which all used the IBM 650. By now, universities recognised the looming need for computing courses in, at first, data processing.

The University of Canterbury and the University of Auckland installed IBM 620 computers in 1962/1963 to support courses in Business Data processing and Scientific Computing [28]. This small step towards educating the workforce in the new technology would later lead to a recognition of the need for school children to have at least, a basic introduction to computers.

This paper examines the issue of computers in New Zealand schools from New Zealand's perspective. An examination of the challenges faced by New Zealand is then placed into a more global perspective by examining Australia's approach to the challenge followed by looking at the issue faced by other similar countries that also struggled to find the right computer for their schools. Finally, a brief discussion of the New Zealand designed computer peripherals for the visually impaired that was developed during these years is undertaken.

Computers in New Zealand Schools

The Department of Education acquired its first computer in 1959. This and other computers acquired by education institutions at this time were intended primarily for research or their own data processing. The Auckland Institute of Technology, now the Auckland University of Technology, in 1967 developed New Zealand's first one year fulltime computing course for students [17]. As early as 1974, programming courses were taught in schools as part of the maths curriculum [3]. However, there were two significant obstacles to teaching computing in schools: the first being the lack of computing knowledge of the teachers and the second being the availability of suitable computers for schools.

Early computing courses, such as that offered by Massey University in Palmerston North, were designed for schoolteachers to learn basic data processing. In these early courses, the students would practice data entry by utilising punch cards which were then sent to a company with a suitable computer for running the programmes. The results were then passed back to the instructors to tell the students the success or not of their endeavors.

Herein seems to lie the dichotomy faced

by the NZ Government and the primarily computer scientists of the New Zealand Computer Society who frequently advised the government: what is the point of teaching computing to students? Is it to teach students how to use a computer, or is it to use a computer to teach students? This issue would remain unresolved for many years while New Zealand struggled to find its direction in computing in education.

This interest in teaching computing and utilising computers to teach non-computing subjects in schools was more seriously considered in 1977 with the release by Commodore of the PET 2001-8, the Apple][and the Tandy TRS-80. This now meant that micro computers were available at relatively cheap cost to the public and to schools.

This 'Trinity' of computers as the press later dubbed these three, heralded the dawning of the home computer age. Considered the first home computer as it was released just before the Apple and Tandy, the Commodore PET seemed like an ideal candidate to utilise in classroom teaching with built-in monitor, keyboard and cassette player albeit with a price tag exceeding most schools' limited budgets.

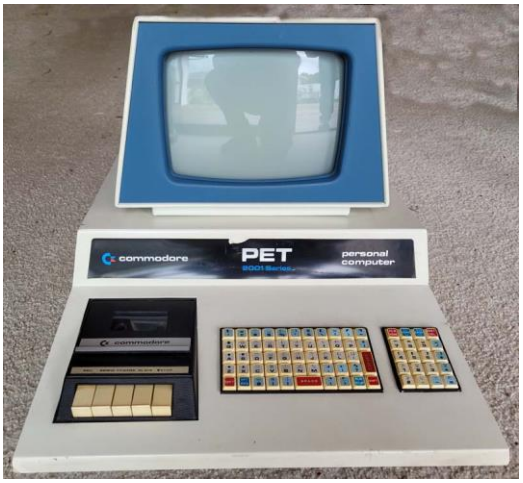

Figure 1. 1977 Commodore PET 2001-8. (Author's collection)

The TRS-80 with its all-in-one design was adopted by a number of schools in New Zealand whilst several Commodore PET models were purchased by schools. However, the optional dual floppy drive (4040) was often needed as an addition as these early computers did not contain internal hard drives and costing as much as the computer at NZ$3414 ($15,700 in 2023 dollars), would see the PET primarily purchased by universities.

These early computers were designed as home computers and not targeted specifically at the education market. The Government, as confused as everyone else about the future of computers continued throughout 1977 with a 'wait and see' strategy. This approach would mean that New Zealand schools would have to wait until a more decisive and favourable Government strategy could be put in place.

The education providers in New Zealand and the government, clearly recognised the need to adopt computing technology in schools and teach both courses on using computers and teaching non-computing subjects by utilising computers. The somewhat chaotic lack of focus seems to have held back the progress with an increasing myriad of computers chosen by schools and little clear thought on what was actually needed, and therefore which computer would fit the role best.

Scientists at the universities had at least achieved their goal of using computers in universities for research and computing courses well before 1977.

The universities' focus by the early 1980s had shifted more towards communication amongst the universities for research purposes utilising the private x.25 network and later, the Internet, rather than computers for individual use [25].

The Poly Computer

In 1981, two lecturers from Wellington Polytechnic, Neill Scott and Paul

Bryant, saw an opportunity to fill the education market gap with a purpose-built education computer. Development began in 1980 with a design for an all-in-one school computer. The Poly, so named because of development at Wellington Polytechnic, would be designed from the ground up with as many features as possible to be useful for the New Zealand school student.

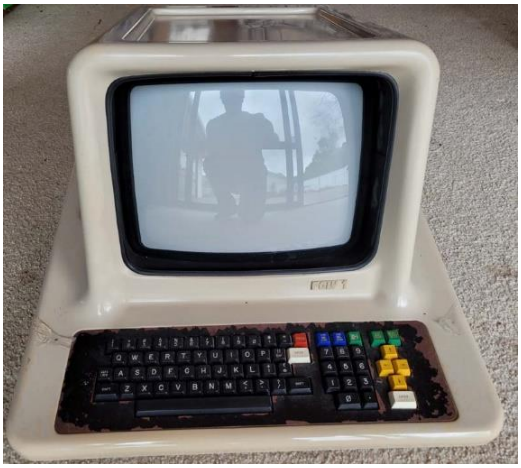

Figure 2. Poly-1 Computer. (Author's collection)

The Design School at Wellington Polytechnic were tasked with designing the cosmetics of the computer [29]. This included a large fiberglass case with handles on the sides so that two students could carry the Poly as required. With six different colours for the housing, this helped to give students a feeling of ownership of their computer and this homegrown all-in-one design was met by the New Zealand government very favourably.

The Poly-1 computer is considered by some to be the first purpose-designed education computer in the world [12, 33], and initially the outlook was promising for the Poly to become the de facto standard for computers in schools. The Poly-1 utilised all off-the-shelf components with 64KB of RAM and 32 bit addressing and a 6809 microchip, a 35cm colour screen taken from a Philips television able to display 8 colours and networking capability via the optional networking hardware [29].

The Poly computers required software on an 8-inch floppy disk and a dual 8-inch floppy drive unit could be purchased as an option. Later, the Proteus was developed, and this was effectively a Poly computer housed in a floppy drive case with dual processors. A Polydrive unit could be purchased which gave networking capability for up to 16 computers.

A single sided 8-inch floppy disk held 295,680 bytes with double sided disks holding twice this amount, easily sufficient for the software at the time. The cost of a complete system consisting of a Poly computer with Proteus drive was NZ$8090 ($37,000 in 2023 dollars). Even the most basic configuration with no disk drive and no networking capability was over half this amount.

A computer is only as useful as the software that it runs, and this led to two requirements; a suitable operating system and a suitable supply of education software. The operating system decision was solved by offering three different operating systems. These were the custom O/S Polysys which included PolyBasic, Flex O/S, ported to run on the 6809 processor and could run a number of programming languages including FORTRAN, FORTH, PASCAL and C, and CP/M utilizing the Z80 processor in the optional Proteus unit [37]. The choice of 3 operating systems allowed the Poly to utilize custom-designed educational software as well as more commercially targeted software, especially with CP/M which was a very common operating system prior to Microsoft DOS becoming more common from 1981 onwards.

Perce Harpham had established New Zealand's first computer software company in 1968 [15]. Systems and Programmes Ltd, later renamed Progeni Systems Ltd (a portmanteau of

Programme Generating) had been established as recourse to Britain's announcement in 1967 that it was joining the European Common Market [15]. There was concern that New Zealand's privileged position as a supplier to 'Mother England' would disappear, meaning New Zealand may need greater economic independence. Progeni Systems Ltd had some history with education in New Zealand, having previously provided a timetabling system through The Education Department to six New Zealand schools in 1971. With a successful record of providing the Government with software over the next decade, Progeni won the contract to produce the Poly's education software.

The Poly-1 and later Poly-2 were marketed as New Zealand computers for New Zealand schools and a significant investment in software development for these computers was made, utilising both professional programmers and 60 non-progamming teachers who gave up their Christmas holidays to develop the software and course material over the 1981 summer break. Additionally, 30 local suppliers produced parts for the Poly computer [15].

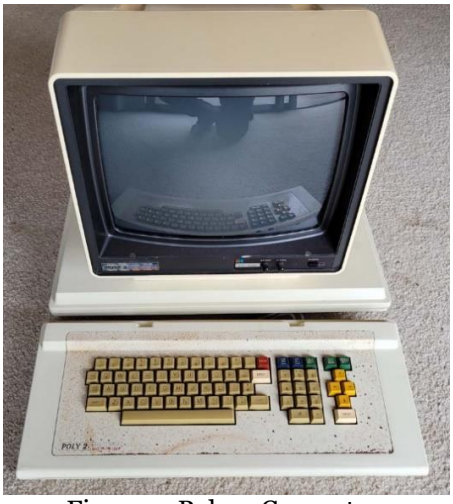

Figure 3. Poly-2 Computer. (Author's collection)

Two classroom trials had proceeded satisfactorily and in 1981, the New Zealand Government entered into discussions to purchase 5000 Poly computers over the following 5 years for a discounted price of $10,000,000. With this apparently confirmed order, the Poly-1 and the later model Poly-2 looked set to fill the educational requirements of all state schools in New Zealand for several years. Several thousand Poly-1 computers were eventually sold to the public and schools in New Zealand along with the Australian Defence Department for training. However, the Poly had by no means become any sort of standard computer for schools. Rather, each school was still free to select the computer that they saw would best fit their needs, even if those needs remained unclear.

Even this slightly clearer focus on what was needed, and the successful production and delivery of hundreds of computers didn't win over the bill-payers, with one commentator stating, "there is no sign of any coherent thought in the recommendations. They pass the buck to schools in every respect" (Bits & Bytes, 1983).

In 1982 the government suddenly cancelled the order for the computers amongst a financial crisis with the Bank of New Zealand. Cabinet Minister Warren Cooper famously stated as a partial justification for cancelling the order that, "he could see no reason why Government should spend money so that teachers could do even less work" [15].

The Aamber Pegasus

A little-known NZ-made computer had also entered the market in early 1981 intending to provide both a home enthusiasts computer and an education computer at a much cheaper price than others available at the time. Aamber was a play on the Chronicles of Amber by Roger

Zelazny, but with an additional 'A' to differentiate it from the fantasy series. The Aamber Pegasus was designed by three students out of the University of Auckland, who formed a company based in Parnell in Auckland and produced approximately 200 computers.

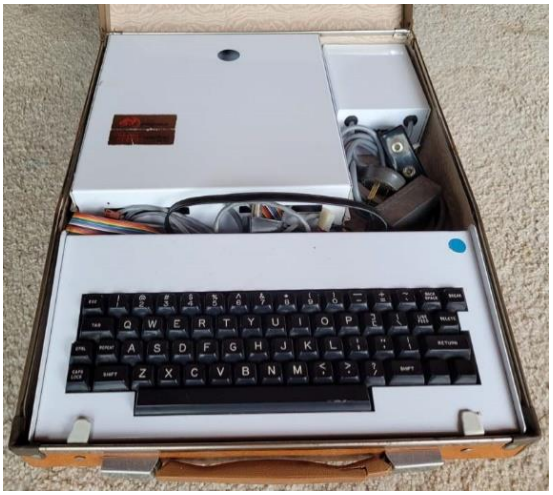

Figure 4: Aamber Pegasus
(Author's collection)

Stewart Holmes was a Master of Science student at the University of Auckland and was working in the physics laboratory on the 6th floor of the UoA Physics Department. He and two other students worked to design a home/education computer during their studies. In January 1981, the PCB schematics for the Pegaus were laid out using Bishops Graphics stencils and tape on transparencies. A wire-wrap prototype was completed and by mid-1981 the computer was ready for sale [19].

Like the Commodore PET and other computers at this time, some software was written to ROM. The Pegasus had removable ROM chips on the main board so that users could select the programming languages and other software when ordering the computer.

The Pegasus, with 4KB of RAM, favoured the more technically savvy user but was at a much more affordable price of NZ$998 ($4600 in 2023 dollars). This bare-bones computer utilised software written to ROM chips, where an expansion board was available with an additional 6 ROM chips providing, usually, 6 additional games.

These were selected by turning the accessory knob to 1 of 6 different positions. The owner was left to mount the dial by drilling a hole in the keyboard wherever they felt there was room. The additional wiring was also left to the owner to sort out.

This gave a choice of software depending on which ROM chips were purchased. The in-house developed software included Tiny Basic utilizing a single ROM or full Basic using 2 ROMS. Additionally, FORTH MAD (Micro assembler/disassembler) and games including Galaxy Wars, Invaders and Tank could be included with the optional ROMs. A Farm Manager programme was also developed and available. Government finance did not eventuate, and the small start-up company was sold in June 1981 and renamed Computer Machinery Limited. Technosys, the company that made the Pegasus lasted just over 12 months, closing its doors at the end of 1981.

With a cheap price but a complex method for installing and running software, perhaps it is no wonder that schools decided not to adopt the Pegasus.

By 1982, approximately 90,000 computers were in schools in the USA (New York Times, 1982) and New Zealand was keen to follow suit. By the end of 1982, 351 schools in New Zealand (89%) had at least one Apple computer [24]. It wasn't just the larger schools that were providing students with computer lessons. Rotorua Boys High had purchased a number of Poly Computers and the New Zealand assembled MDL (Microprocessor Developments Ltd) computers. Karamu High School, a small rural school, allowed students to take computers home with them [23]. Initially a Sinclair

ZX80 had been purchased, and later several ZX81s. These were ideal for teaching computing as with a small physical size they could easily be taken home in a school bag (and back).

Other Education Computers in New Zealand

Whilst the New Zealand government moved slowly on the issue of computers and computing in New Zealand schools, the technology and the commentators of the day tended to move quickly. The problem of which computer was the 'best fit' for schools had never been resolved, partly through a lack of focus and partly because there were so many choices. New Zealand had certainly tried, particularly with the Poly but also with the Aamber and MDL.

The year 1981 proved to be a critical point for New Zealand with the opportunity to establish itself as a world leader in computers used in education. The Aamber Pegasus could be considered something of an enthusiasts' computer or at the least, a computer that required some technical know-how to get the best out of it. In contrast, the Poly series of computers were designed for education and so came complete, in one convenient and simple to move package. The chance was there at that critical time for the New Zealand government to carry through with funding the Poly in schools with the likely expansion further into Australia and possibly other countries. The opportunity was missed and so the Poly would become a footnote in history of what could have been.

The technology commentators of the day attempted at least a discussion of which was best in an article in Bits & Bytes magazine in 1983. The article, 'Heads in the Silica' reviewed 5 possibilities, the Apple][, the Poly, the BBC micro, the NEC 8000 and the BMC 800 [4] .

This article, written about the process of requiring a list of consultants and civil servants to determine the recommended computer, describes the outcome as something that a 'sixth former with a set of computing magazines might have done in a free period'. The result was a recommendation of the aforementioned five computers, with no guidance on which, if any, should take priority.

By 1983, the need for computers in schools and computing courses had been firmly established, at least in the minds of teachers, parents and students. Whilst the uptake by schools took time, particularly as there was no clear strategy to get computers into schools, the need for school leavers to have at least a basic knowledge of how to use computers was clear.

The New Zealand Bits and Bytes Magazine ran an article in 1983 calling for computer studies to become part of the school certificate examination choice for 15 year olds, who could leave school at this age [26]. One commentator stated in 1983 that 1982 had seen most New Zealand schools purchase a computer with some schools purchasing two and a 'fortunate few' having half a dozen or more. The funding had come from the parents and schools in the absence of government funding, and was estimated to be approximately $1,500,000 for that year [31].

Many teachers felt a home-grown computer was still suitable for New Zealand schools. For this reason, the Poly was still seen as a possibility to find a foothold in New Zealand schools. By 1984 there were 274 Poly-1 computers in schools with 116 of these in secondary schools [11]. The idea of the Poly becoming the de facto standard had in-effect been extinguished when Apple announced a substantial discount of

their Apple][computers for schools in New Zealand.

The Apple][was initially offered at 25% of retail, a significant discount that now put the Apple computer within the reach of most schools' budgets.

However, Polycorp immediately complained to the Government that Apple were dumping cheap computers onto the New Zealand market. Apple were forced to increase the price to avoid 'dumping duty' in what at the time was still a protectionist market.

The discount was reduced but still amounted to 33% of the retail price and almost immediately the Apple computer became the more favoured for schools, with a complete Apple][system costing NZ$2020 ($9300 in 2023 dollars) [30].

This meant that most schools could now buy at least one computer, and in many cases, the planned computer for the school could become 3 computers for the same cost. Ultimately, the substantial discount and by now, proven record of the Apple won the day for many schools.

By 1982 - 1983, other manufactures had seen the value in the education market and were either producing computers with education in mind or producing computers that could be equally used at home or in schools. Commodore had recognized this opportunity early on but failed to capitalise in a somewhat lethargic New Zealand market.

New Zealand was progressing with its own way forward in education, but other similar countries were also struggling with the issue: which computer or computers are best for the needs of their schools? A look at the influences around the world in similar countries assists in putting the struggles New Zealand authorities were having into a more global perspective.

Australia

By this time, Australia had also dipped its toes in the murky waters of computers for schools. At the same time as the Poly was being produced in New Zealand, Australia recognised both the need for computers in schools and the opportunity a home-grown education computer could bring to the Australian computing industry. Australia also faced the issue of which computer to use, and this was exacerbated by the country having multiple states, each to some extent self-governing their school system.

In 1974, the Monash Educational Computer System (MONECS) was established by Monash University with the goal of using a DEC PDP-11 to teach computer programming to secondary school children. This was followed by experimenting with Control Data's PLATO system for instructing apprentices on the use of computers [32]. In 1981, Tasmania and Western Australia cooperated in computer education, partially because both states had decided on the BBC Micro as the de facto standard for schools in these two states. This cooperation, including with South Australia was called TASAWA, but was strongly discouraged by the Commonwealth Schools Commission because the cooperation between three states was seen as overly exclusive [27].

Two years later, the New South Wales Department of Education created a Computer Education Unit with the aim of bringing together 'curriculum development, consultancy support and in-service teacher education. They provided advice on the selection of computer equipment for schools and evaluation, development and distribution of software and other resource material. The computer selected to become the standard was the Microbee, along with limited numbers of Commodore 64 computers.

The Microbee, an Australian designed computer was sold in Australia and New Zealand as suitable for home and education purposes. At NZ$525 for the 15k version (NZ$2000 in 2023) and NZ$927 for the 64k version it was competitively priced [5]. However, by 1982 for most Australian states the decision had already been made to look elsewhere than 'local' computers and so the Australian Microbee came too late to be considered for widespread use in schools in Australia but limited numbers of Microbees did find their way into New Zealand schools.

Other states in Australia were by 1982, developing programmes for computers in schools that proved to be diverse, with local standard computers but without a federal standard. Victoria had the State Computer Education Centre utilizing the Apple][e and Commodore 64 computers, Queensland established a year 12 information processing syllabus in the mid-1980s focused on teaching programming with the Apple][, and The Territories had the Computing Services Section of the SCT Schools Authority which was responsible for computers in ACT schools. By the mid-1980s, this had evolved into the Computer Education Unit.

The issue with separate and somewhat autonomous states can perhaps be highlighted by the recommendations made for a standard school computer.

No computer was singled out as satisfactory for all Australian schools with New South Wales recommending the Microbee, the Apple][e, the Apple Macintosh, the Acorn BBC Micro Model B, the IBM JX, Tandy 1000 and the Sperry PC. In Victoria, the preferred machines were the Apple][e and Macintosh; the Acorn BBC Master 128 and Model B; the Microbee; and the IBM JX. Other states and territories recommendations were the Apple][e, the Acorn BBC Model B, the Microbee and the Commodore 64 [27].

With a willingness to have computers in Australian schools but with the common issue in the early 1980s of 'which computer', Australia was also faltering as it tried to find the right strategy for schools and the right computer.

In 1983, the Australian Government's Commonwealth Schools Commission established the National Advisory Committee on Computers in Schools (NACCS). The aim was 'to provide leadership and funding for all Australia States and Territories'. In 1984, a budget of A$18.7 million was allocated to the programme [8]. Australia, after some faltering was now finding its way by utilising the Federal Government and a nation-wide plan to achieve a clearly stated goal.

THE WORLD CONTEXT

At the same time, other countries were struggling to find the right strategy and computer, with many countries favouring a domestic model of computer for their education system. The following discussion looks at what was occurring in this area in the United Kingdom, the USA and Canada, countries that New Zealand was looking to for guidance and therefore had significant influence over the computer market in New Zealand. This is followed by a brief discussion of two American computers designed for education in schools and universities in Canada and the USA.

United Kingdom

Governments around the world were aware of the growing need to teach computing technology in schools and the benefits of using computers to teach schoolchildren in other subjects. On the 6th April 1981, the Prime Minister of the United Kingdom, Margaret Thatcher

delivered a speech on microcomputers in schools. The speech began with the prophetic words,

> "Our future prosperity depends in large part on the quality of education today. That quality requires not only that children should learn the familiar basic subjects but that they should also be able to understand computers and how they can be used and applied. We must remember that today's school children will still be working in the year 2030".

The Thatcher Government introduced the 'Microcomputers in Schools" scheme as the Government's vehicle for establishing an Information Technology programme for schools.

The speech continued:

> "Those now at school will need to adapt to each new technological advance if we are to remain an industrial power and to create new products and jobs in the service-based industries.... The computer is each pupil's own personal teacher—a teacher with infinite patience which can work at his own pace.
>
> For children all this is fun—but it also has true educational value. Children learn to question, command and understand this powerful tool. Of course, learning about science and maths is easier but the computer is just as much at home in the school workshop and in providing information about history and geography." [34].

For a speech written over 4 decades ago, well before most people had even seen a home computer let alone used one, or for that matter the establishment of the Internet, it is remarkably insightful. However, the same problem that had slowed decisions by the New Zealand government concerned the UK Government; which computer to use in schools?

The government was naturally focused on a British computer and so initially looked towards the Research Machine 380Z. This was a computer designed for research scientists and released in 1977. This 8-bit computer manufactured in Oxford fit well with the British-built philosophy but by 1981 was already out of date for education purposes. Further, the cost was £3200 with all options (£16,800 in 2023) which was simply out of reach for the education market.

In 1980, more computers were being produced in Britain to meet the rapidly growing demand for home computers and several of these would also prove suitable for schools. These included the Amstrad (Alan Michael Sugar TRADing), the ZX Spectrum and the Acorn range of computers. Acorn produced a series of home computers that were used in schools, including the Acorn Electron, Archimedes and the Atom in 1980 at just £120 without a monitor.

At the end of 1979, the British Broadcasting Corporation had initiated a national educational programme called the BBC Computer Literacy Project. By 1980, this Project was having a significant impact on computer education, at least in the British home.

It was supplemented with a television series, 'Micro Live' and standardized the use of Acorn computers for those who wished to follow along with the series to learn to use computers. The Project provided a list of required specifications to find a suitable computer which was won by Acorn. Acorn produced a series of new computers and named them BBC rather than Acorn. The Acorn Atom had in turn led to the Acorn Proton which in turn led to the Acorn Micro, which utilised the well-established MOS 6502 processor developed by MOS Technologies. A company that by this stage had been purchased by Commodore [22].

The project was so successful that the BBC Micro in its two variants, the A for £235 (£811 in 2023) and the B for £335 (£1150 in 2023), established themselves as the de facto standard for computer education in the UK and several Commonwealth countries [35].

Over a 13 year period from 1981 to 1994, these two computer models would sell over 1 million units [18]. The UK Government, with considerable assistance from the BBC in the form of the Computer Literacy Project had achieved what others had not: a successful computer literacy project and a de facto standard computer for UK schools.

The British pride in computer design and manufacturer saw Margaret Thatcher, in 1983, present a Sinclair ZX Spectrum to the Prime Minister of Japan thus demonstrating the technological advances Britain was making [16] with Clive Sinclair later receiving a Knight Bachelor for his contributions to the personal computer industry in the UK.

USA

In the USA, Commodore, originally a calculator company, had begun manufacturing computers in 1977. The owner of Commodore Computers, Jack Tramiel famously stated, "We want to manufacture computers for the masses, not the classes" [2]. This approach of affordable computers incorporating components made by companies owned by Commodore and designed to sell millions saw the Commodore VIC-20 computer released in 1981. With just 5KB of RAM but with a price tag of US$299, later reduced to just US$89, and sold through department stores rather than computer stores, the VIC-20 become the first computer in the world to sell over 1 million computers [9], with manufacturing turning out 9000 units per day at its peak [2].

The packaging on the VIC-20 describes it as being suitable for "Family, Business and Educational use!". Clearly Commodore, led by Trameil understood both the need for computers in the education system and the opportunity this presented for a company with a large manufacturing capability.

Commodore, after failing to seek a deal earlier, now offered the VIC 20 with the optional cassette recorder for NZ$1000 ($4568 in 2023 dollars). A standard VIC20 retailed for NZ$795, so in effect, the discount amounted to a slightly discounted cassette drive.

The following year, 1982, would see the introduction to market of the Commodore 64. At US$595 and equipped with 64KB of RAM along with colour graphics and almost 1MHz CPU, the C64 would go on to sell an estimated 22 million units and remains the best-selling computer of all time [14]. Clearly choices for suitable computers were becoming available from 1981 onwards and the excuse of high prices with limited functionality were being overcome with cheap, reliable, simple to use and 'powerful for the day' computers from overseas.

However, in 1982 the Educator 64 was produced, effectively becoming another computer specifically designed for education use. The Educator 64 came out of trials in schools in the USA with the Commodore 64. The Commodore 64 computer, with its relatively small 'bread bin' shape and size had shown vulnerability to damage and possible theft. Commodore responded to the feedback from schools by offering the Commodore 64 motherboard in a PET case. Most Educator 64 computers used the Commodore 4000 family of cases with refurbished Commodore 64 motherboards inside.

The motherboards were the results of

user-returns and were repaired and put inside the larger PET case so that they were much sturdier, came with a monitor built-in and were too large to fit surreptitiously into a school bag.

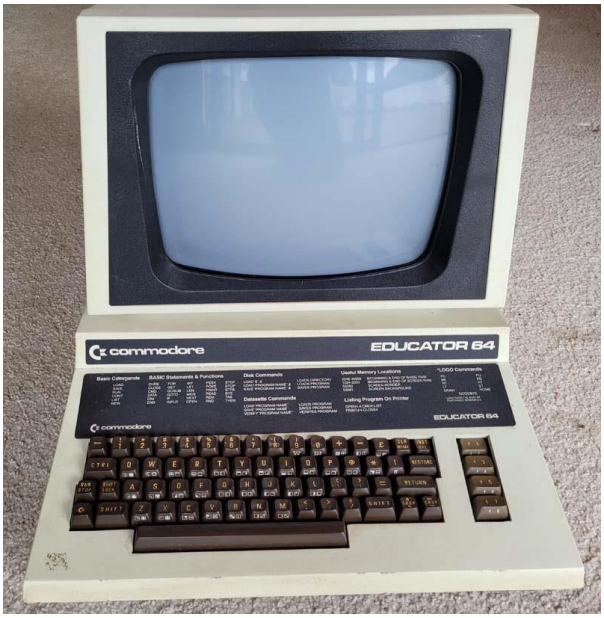

Figure 5. Commodore Educator 64. (Author's collection).

The screens, being from the PET line were capable of shades of green only on the Educator 64 and the addition of a speaker with volume control were the main differences from the standard Commodore 64 [38].

By now, New Zealand had missed the opportunity in the school education market. The Poly and Aamber could simply no longer compare to the computers from Commodore, Apple and the emerging home IBM computers amongst many others coming from manufactures all over the world. These computers, including Apple, BBC, Commodore and others were far more advanced and in the case of the more home-focused designs, considerably cheaper. Additionally, other Governments and institutions had, by the end of 1981, developed strategies to get computers into schools. New Zealand was no longer a world-leader in this area.

Canada

The Ontario Minister of Education, in 1981, recognized the need to teach computer literacy and the requirement for a standardized computer for this purpose. To achieve this goal, an Advisory Committee on Computer in Education was convened with the aim of designing a plan to introduce computers into schools and to agree on a configuration for a suitable computer.

Specifications for the computer led to a decision to have a computer manufactured in Canada and specifically designed for education. The specifications called for, among other requirements, colour graphics, 64KB of RAM and networking capabilities. These requirements fit well with the Poly-1 computer design, but Polycorp at this time was focused on the Australasian market assuming that this would provide orders that would be sufficient for the manufacturing capacity.

With Canada being a Commonwealth country, the Poly, perhaps, may have found a market in Canada, but there seems to have been a desire to design and manufacture the computer locally. The result was the 'ICON" in 1983.

Known colloquially as the 'Bionic Beaver', in 1984 the computers were ready for delivery to Canadian schools with a plan for 6000 computers in Ontario schools [13]. The computer was in reality more of a terminal. It came with a keyboard and trackball but with no local storage and instead utilized a file/server model. The Operating System was similar to Unix and software was custom designed for educational use with support from the Ontario Ministry of Education. The purchase of the computers by schools was subsidized by the Government and saw some schools equipped with the ICON, but by 1984 the file/server model was already somewhat limited for

processing needs. This is something that would prove motivating for a further Canadian design for computers utilized in universities. The Ontario Government would go on to invest C$200 million dollars on hardware and software development and purchases in the next 12 years [13].

Computers in Universities

One difficulty faced by universities was teaching programming to students. Whilst the home computers generally came equipped with a version of BASIC built into ROM or with tape cartridges or disks, higher level languages tended to be taught with terminals connected to a mainframe computer as the microcomputers could not run more sophisticated languages. The issue with this topology was that the university's mainframe was often required to be used simultaneously by many students, possibly alongside the university's data processing requirements. This meant that programming students would write their code, run it on the mainframe and wait for 30 minutes or more for a response, often with the bad news that the programme had an error. One university came up with a solution in 1981 that involved a readily available and relatively cheap home computer along with custom hardware designed by the university.

The University of Waterloo in Canada had recognised this need for an education computer suitable for teaching programming. Academics in the Computer Science Department designed an add-on board for the Commodore PET 8000 series (12 inch screens allowing for 80 columns of text) that would allow for switching between ROMs containing the standard Microsoft Basic available with all PET computers and their own design. This design utilised a separate CPU and ROMs containing Waterloo's own language along with several other programming languages including microFORTRAN, microCOBOL, microBASIC and microPascal.

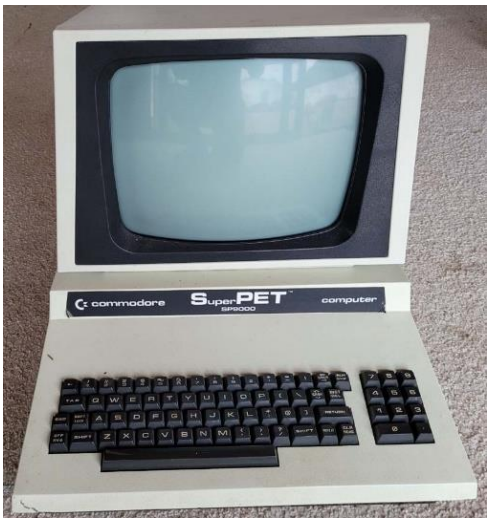

Figure 6. Commodore SuperPET SP9000. (Authors collection)

Whilst this modified PET, called the SP9000 SuperPET or MicroMainframe in Europe, was targeted more towards university computer science departments, it saw considerable uptake in universities and some schools in Canada and the USA. The top of the line standard 8000 series PET was the 8096, with 80 columns of text and 96KB of RAM. By adding a separate circuit board inside the case, the standard MOS Technologies 6502 processor could be used, or if desired, a switch mounted on the side of the case could be selected so that the additional board would run the Motorola 6809 processor.

With an RS232 serial port, the completed programme could easily be shared with a mainframe or other computers. With mainframes costing hundreds of thousands of dollars, the C$2795 (C$8400 in 2023) SuperPet was a cost-effective solution for the university [21]. It was quickly realised that there was substantial interest from other universities in the modified PET.

The Computer Systems Group had been established at the University in 1973

allowing the group, later named WATCOM, to act as an independent software distribution business [1]. In 1980, Commodore donated thirty-five 8032 models to the university giving them a ready supply of PETs for modification to SuperPETs with the additional boards and extra RAM up to 96KB. In this way, the SuperPET was never an 'official' Commodore product but could be purchased already modified into a SuperPET. By 1982, other computer manufacturers including IBM and in 1983 Hewlett Packard were providing partnerships with the university that saw the SuperPET production halted. In just over a year, the design had served its purpose and technology had moved on.

Summary of School Computers

Thus 1980 and 1981 were pivotal years for education computers. The opportunities were missed by some and grasped by others but ultimately the proliferation of readily available home and education computers by 1982 heralded the end of custom-designed or modified computers for schools and universities. Manufacturers, including Apple, BBC and IBM had by now entered this market. Prices were steadily decreasing, cheap and reliable computers such as the VIC-20 and Commodore 64 were selling for a few hundred dollars and with a proliferation of education software readily available this saw custom-designed software no longer needed.

Whilst the Educator 64 and SuperPET were never seriously considered for New Zealand schools, the concept of computers designed for education, stemming from these two models, had some influence in altering the education market focus.

The ready availability of computers from overseas manufacturers at reducing prices and increasing availability of education software was the final straw for New Zealand designed computers in schools. The overseas competition had won the battle by providing suitable computers at cheap prices where the local market could simply no longer compete and so by 1983 New Zealand relinquished its goal of designing and building its own computers for New Zealand schools.

The Poly computer saga does not quite end here. By the late 1980s, China had indicated a willingness to purchase the final version of the Poly line, the Poly C. A more conventional looking computer with separate keyboard, screen and a 3-button mouse and equipped with a built-in disk drive was produced in limited numbers solely for the Chinese market. This computer was based around the Motorola 68030 processor and with a graphics processor and Chinese character keyboard was targeted towards the Chinese education market. Negotiations looked promising before the Tianamen Square incident in 1989. This effectively ended any chance of a New Zealand designed computer entering the Chinese market, and so the Poly story finally came to an end.

Specialist NZ Computers for the Visually Impaired

The history of computing in the education sector in New Zealand is not complete without mentioning a specialist series of computers developed for the visually impaired. A New Zealand entrepreneur, Russel Smith, who had earned a PhD in 1972 in underwater sonar technology from Canterbury University, was meeting with his supervisor when his supervisor suggested that the same technology could be used to assist blind people to find their way in the streets [20].

In 1976, Russel Smith was working for

Wormald Technology and helped create a division called Sensory Aids. Initial products, such as the Sonic Guide, relied on radar-type technology and were mounted in heavy-looking spectacles. In 1978, the second-generation product, the Mowat Sensor, was a handheld device that sent sonar signals out from the device and vibrated indicating an obstacle ahead [20].

In 1983 the Keynote speech system and the Viewscan Text System were released which had an immediate and significant effect. The Wormald International Sensory Aids Text System utilised an Epson Hx-20, arguably the world's first true laptop computer [7]. The cost of the base computer before the add-on in 1983 was NZ$1600 (NZ$6100 in 2023).

Whilst the Hx-20 was comparatively expensive compared to some other computers, it came with a built-in screen of 4 lines of 20 characters, and a built-in printer. Additionally, it was designed for simple expansion, with an expansion port on the top right allowing for a microcassette or ROM expansion cartridge and an expansion port on the left designed for RAM and ROM expansion and custom-designed expansion units.

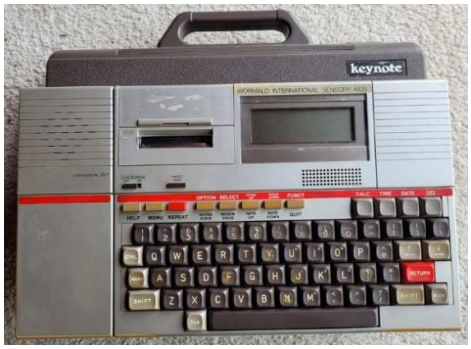

Figure 7. Keynote. (Author's collection)

The text-to-speech system, called the Keynote, mounted on the side of the laptop and read aloud the text on the screen of the computer. The Hx-20 was an ideal platform for 1983, with a battery that lasted up to 50 hours and built-in printer and optional cassette along with the expansion port permitting quick attachment of accessories. The Keynote allowed the user to type words to the screen and the speech synthesizer would read the words as they were typed. This gave independence for visually impaired people who wished to create documents or write computer programmes and was suitable for people with significant visual impairment and those who were blind.

In 1983, the Hx-20 Viewscan system was introduced. The Hx-20 was coupled with a large screen and handheld scanner. The scanner connected to the computer by way of fibre optic cable. The scanner could be dragged across text and the much-magnified text appeared on the screen in orange letters against a dark background. The text could then be saved directly to the in-built microcassette in 3k blocks and from there to 5.25 inch floppy disks in CP/M format.

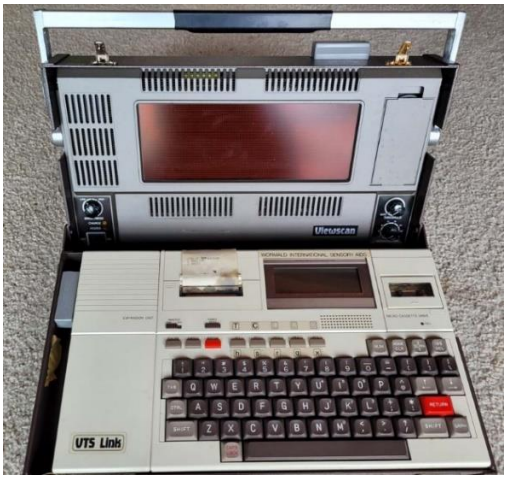

Figure 8: Hx-20 Viewscan (Author's collection)

The add-on system primarily developed in New Zealand, was released around the world and had a significant impact for the low-vision community. This was due in no small part because the compact design of the Hx-20 allowed for add-on devices that still permitted the computer to be carried by hand. Other, overseas systems required a sizeable desktop arrangement with magnifying hardware. These early

devices had few comparisons in 1983 and would form the basis for the company to go onto greater developments in this area.

Wormald International Sensory Aids continued development for a few more years before a management buyout with Russell Smith at the helm of the company saw Pulse Data as the new company name. This company would see significant recognition for its 2000 release of Braillenote, a portable braille assistant device. The company then reformed into Humanware after a merger in 2005.

Just nine months after this company was formed in 2005, the founder of the company, Russell Smith was tragically killed in a light aircraft accident in New Zealand. With the company based in the United States of America, New Zealand's involvement in this area largely came to an end, although the company continues and remains a leading developer of hardware for the visually impaired.

Conclusion

New Zealand has an interesting history with computing, both in business and in the home market [36]. With the Poly-1 and Poly-2, hopes were high when New Zealand was early to market with a dedicated education computer. The year, 1981, proved pivotal for computers in schools. There was a will by many governments who recognized the need for school leavers to be computer literate, and a desire to get the computers into schools quickly.

Technology moves rapidly and with basic computers with limited memory and computing power, a year, for example, was the difference between 5KB of RAM and 64KB of RAM (Vic -20 vs C64). The Poly computer's contribution to computers in education was significant for a very brief period in 1981 and 1982. It so nearly formed a much more lasting contribution to this area, but with other Governments generally keener on development of home-grown computers, a lack of funding that was so desperately needed to produce and further develop the Poly, that did not eventuate, and technology moving on so quickly, the Poly has become a footnote in New Zealand computing history.

This lack of funding from the government, combined with confusion in the early 1980s as to what the computers were actually going to be used for, led to a stuttered start to school uptake of computers for education. The New Zealand Computer Society, formed in 1960 as the Data Processing and Computer Society, has acted in a watchdog role, advising the Government of the day about computers and their place in New Zealand. The Society was very active during the early years of computers in schools and universities and provided very valuable insight and guidance for what computers could do and their future place in the country. However, much of their advice and guidance was not followed and so it was left to others, professionals and visionaries, to take the reins.

Whilst the New Zealand designed and built computers such as the Poly and Aamber seemed to have potential, the reality is that overseas computers evolved quickly and were, by the early 1980s, reducing in cost to the point that New Zealand manufacturing could no longer compete. The opportunity to capitalise on such innovation as provided by the Poly was missed, and within a year the Educator 64 and SuperPET had followed as computers designed for the education sector.

However, it was the introduction in 1982 of the heavily discounted Apple][computers that finally produced some

hope of standardisation, at least in the short term. Whilst New Zealand had endeavored to lead the way for just a year or so in this market, the contribution was nonetheless significant. A dedicated design for an education computer along with specially developed software for education that had teachers significantly involved in writing the software and creating courses alongside the software led to greater competition in this niche but significant market. Ultimately, the schools and the students were the winners of this competition. Education has played a significant and important role in this vital area of computing and New Zealand has performed well in its role in getting computers into schools, beginning in the early 1980s.

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