6 Multi-tasking cyborgs: Implications

Connections

The volume of evidence that was collected suggested that an initial hypothesis, that students would produce transactional and analytical work in greater quantity, was only true for those subjects which expected it: Business Studies, Economics, Geography, some Science projects and technology. Perhaps the most significant factor, however, was the way in which these objects were produced. Many students were producing work without feeling that they needed to master programs and operating systems beforehand. They were, in a very real sense, 'just-in-time' workers. Teachers supplied the tasks; they supplied the ideas; the computer made it all work.

Working with computers

The surveys of student computer use from 1995 onwards showed the extent to which a significant number of students used personal computers. Student comments indicated the range of activities for which these machines were used. Indeed, many students commented that they regarded schoolwork, learning and computers as synonymous. Reference has been made to these comments earlier in the study. Their significance, however, is such that they bear repeating again.

Additional material can be found in Appendix two and Appendix Three.

> Now I use my computer for all the work I do apart from Maths and things like that. I can draw on my computer, make music, listen to music, write stories, look up words to find a meaning for it like a dictionary, print out any work I want for homework. I think it makes homework a lot easier because of all the different programs.
>
> (Girl, Year 9.)

This student has created a working environment with her computer, which provides her with the tools and support necessary for the work she produces to be a reflection of her capabilities. Her abilities are augmented and enhanced by the tools which she uses.

> Computers can make homework need a lot more time, even if you're very good at using them, because you end up spending a lot of time tweaking your work. The end product can look very good, especially with expert use. Spellchecks and automatic language aids such as Thesaurus help your writing. Computers with reference software, such as "Encarta" are great for research. AmiPro2 is the best word processor/d.t.p. program in the world. Apart from AmiPro3. You can also sharpen up your brains playing games such as Tetris and Doom.
>
> (Boy, Year 10)

The judgements made by this boy focus on what is done - the homework, and the fact that more time is spent on it - and how it is done. The awareness of 'expert use' of software and its built-in tools is that it enhances the product. The sub-text is that the user is enhanced: *'You can also sharpen up your brains …'* The computer-human interface is part of his discourse.

> I had my first computer when I was six. I've used one ever since.
>
> (Boy, Year 12)

The human-computer interaction described here has been a constant theme in the surveys conducted during the period of this study. As the technology has become more powerful, flexible and sophisticated, so it has become more open to being customised by student users. Individual needs and circumstances have enabled a constantly evolving setup and use of the equipment. Students regard the layout and look of the Graphical User Interface as both a reflection of, and extension to, their personality. In this sense then, if no other, they have taken on attributes of cyborgs.

'Cyborgs'

The image of the cyborg as a super-human combination of the mortal and technology has been part of popular culture for more than twenty years. The term 'cyborg' was initially coined to describe human enhancement: a man-machine system, or hybrid, that would be necessary to survive in, and adapt to,

the extra-terrestrial environments of space flight. Routine checks and monitoring would be undertaken automatically, so that the human would be free to create, think, feel and explore. (Clynes and Kline, 1960) Cyborgs can also be seen as the tangled networks of meat, metal and technologies that we have become: creatures in a world that is post-gender (Haraway, 1985).

The integration with technology enables humans to transcend their corporeal limitations. This is true for individuals fitted with prosthetic limbs; with heart pacemakers or whose use of pharmaceuticals enables them to overcome bodily malfunction. Science fiction fantasies on television and film, such as The Six Million Dollar Man, Terminator or Robocop, provide a leitmotif for the concerns of our age in much the same way as Frankenstein served for the Enlightenment. Cyborgs, then, provide a route for us to stand aside from the limitations imposed on our bodies by restrictions of race, gender, class and socio-economic status.

The students in this study can be regarded as having integrated with computer technology because the operations which they undertake using the machines have been internalised. That is to say, the programs and routines that they use, they use intuitively. The hardware and the software which they use is seen as a means to an end. They are a tool, a vehicle for combining motor skills, language, images and symbolic manipulation through practical activities. They are enabled to stand aside from the limitations imposed on them as subordinates in the school system

So computers are the tool, the vehicle for combining motor skills, language, images and symbolic manipulation through practical activities. These practical activities reflect a series of often complex thought processes. They represent a cultural tool that enables the mediation of thought (Wertsch, 1998). The technology enables these processes to be amplified and developed in ways which reflect the integration of technology. Fast multi-tasking has become one indicator of this integration. The students may fail to reflect media images of Cyborgs such as Robocop or the Terminator, but their behaviour and artefacts, products of that behaviour, suggest that the myth is manifesting itself. Computing technology has transformed student expectation of what is possible: the limit is perceived to be that of the technology itself.

A survey of 918 students aged 12 - 18 showed that a comparatively small percentage listed computers either as ways in which they learned or as ways through which they should learn. This is perhaps not so surprising as it might seem. The extent of computer use would suggest that most students do not regard computers as a subject, something which has to be learned. This

compares with the concerns of teachers, who in many cases feel themselves to be in need of training so that they may teach their students about computers: Information Technology, rather than information technology.

Table 6.1: Learning with computers

	Student uses a computer for learning.			**Student thinks that computers should be used for learning.**		
Year	Female	Male	All	Female	Male	All
12	30%	50%	40%	6%	0%	3%
10	13%	22%	17%	3%	8%	5%
9	0%	10%	5%	2%	3%	2%
8	4%	13%	8%	9%	14%	12%
7	11%	8%	9%	3%	8%	5%

The high level of response for Years 12 and 10 are attributable to Internet use, specifically cited as an information resource and a way of learning. Other instances cited were linked to the multimedia encyclopedia on CD-ROM, Encarta. Those students who thought that computers should be used for learning gave as their reasons the availability of information on the Internet, and the way in which work could be done individually on the computer. There was no mention of online learning and virtual schools. Whether or not students see schools and learning as synonymous, they do not perceive schools as being 'virtual'.

These figures support statements made by students throughout the surveys, that learning to use their computers is a by-product of using them: they are 'learning how', rather than 'learning about': the learning is how to achieve what the student wants to achieve.

Cyberspace

'Cyberspace' is a term that originated in science fiction to describe virtual worlds. Its most common use, however, is to describe a range of aspects of everyday life connected with computers and the Internet. The use of electronic mail, Internet chat rooms and discussion groups and participation in virtual

communities have all contributed to a culture in which simulation is accepted as part of the experience which constitutes the post-modern condition. Electronic data transmission enables 'cashless' economies and purchases; online games provide challenges against opponents whose identity exists only on the screen.

An alternative interpretation of cyberspace is that of an ideology, for those who see themselves as transcending the limitations imposed on them by the society in which they live (Virilio, P. 1995). This concept of cyberspace is seen as a way of being in contact with a global community in which links can be established with those who share the same interests or apparently think in the same way. Those who see themselves as part of cyberspace have a sense of power, endowed by the exclusivity of the skills and concepts shared by the global community. They regard themselves as the cutting edge of technology. This power is reinforced by the anonymity of cyberspace and the apparent lack of temporal responsibility and accountability.

The individuals who are empowered by possession of computer communications see themselves as technological superheroes, moving from one part of the globe to another in nanoseconds. Access to information (whether real or imagined) is what differentiates technoheroes - Virilio's term for what many young people consider to be cyborgs - from the rest of humanity. The structures of inequality are compounded by the continual and rapid updating of hardware, software and the skills and concepts with which they are associated.

When these changes are coupled with increased investment in new communications technologies by business and industry the substitution of the economic factors of labour by capital further disenfranchises those who lack the skills needed to exploit new possibilities.

Technoheroes reify this constant advance: the latest upgrades, the latest skills and the latest vocabulary are all essential to staying ahead: having the edge needed to ride the InfoWave. Students adopt these rapid technical developments as another facet of their perception that life is a process of constant change.

> Computers are the future they are quick and easy.
>
> Boy, Year 9.

Table 6.2: Changes in the cost of computer memory

Average price per megabyte of computer memory (US$)												
1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999 (est)	2000 (est)
$11.54	$9.30	$6.86	$5.23	$3.00	$1.46	$.705	$.33	$.179	$.101	$.068	$.039	$.027

Source: Porter, J. (1998)

This constant change can be demonstrated in Table 6.2, which illustrates the dramatic fall in the price of computer memory. (This smooth progression conveniently ignores the spikes caused by surges in demand, earthquakes in Taiwan and other glitches of globalisation.) The sub-text is the dramatic increase in the demand for computer memory by software packages. Over the past five years the price of a computer package has remained relatively stable: what has changed is the level of specification available for the price that is paid. The concept of 'more for your money' drives people to upgrade their machines with increasing regularity.

> Computers are expensive but if you didn't have one you probably would be degraded because of it in later life.
>
> Boy, Year 10.

The comment used by this student in his letter was reflected by a number of others, who saw computers as creating added value in their schoolwork, which would then lead to greater opportunities for progression. It perhaps reflects the post-industrial nature of Leeds, in which employment in the secondary sector of production, manufacturing, has been in steady decline for the past twenty five years. The biggest employment area is in the service sector, more specifically in the banking, insurance and financial sectors.

Computers and enjoyment

Many students have commented that they enjoy working on the computer. A number have described it as 'fun'. Whilst this may, in part, be due to the fact that they can listen to music and play games whilst they are working, other factors should be taken into account to explain the element of 'fun' and enjoyment.

The focus of many consumer electronic technologies has been on ludic elements: that is to say, aspects of games and play. Early surveys of student computer use revealed an ambiguity as to what constituted a computer, especially among younger students. Many mentioned games consoles or hand-held electronic games. Commodore Amiga computers had been purchased in the hope that they would offer both a platform for sophisticated games playing and a tool for schoolwork.

These elements of play have been incorporated into mainstream applications, most specifically as icons, prompts and Wizards. Indeed, many programs offer animated initial screens as a way into the content. Whilst these were first targeted at younger users (as in Microsoft's Creative Writer and Creative Artist) they have spread to other programs (for example, that for Epson Stylus colour printers). The development of the Graphical User Interface (GUI) presents the computer user with an interface that initially simulates the space on a desktop. The user can then customise the space by installing short-cuts to favourite programs and document folders, personalising the screen-savers: in short, making the machine a reflection of the user's personality.

The GUI also presents an opaque interface with the computer: there is no necessity to learn sets of commands and then use these to instruct the machine. The user points at 'objects' and clicks to activate them: on-screen Wizards supply questions, prompts and instructions to enable users to achieve their purpose. Students can point and click at programs, documents and objects; switch from one to another; perform one task whilst another is running in the background.

Multi-tasking

The conventional understanding of multi-tasking is that of a computer running a number of programs simultaneously. One program will run in the foreground (a word-processor), whilst others run in the background - a print manager printing a number of documents; a database indexing a datafile. Other programs will foreground themselves: email announcements; error messages from the operating system; 'paper out' reports from the print manager. Other instances of multi-tasking occur when students have a number of windows open on the screen and switch from one document to another as they are working.

Comments from students in previous sections have illustrated their use of multi-tasking capabilities whilst they work with their machines. One way in which students switch from one task to another is the combination of the ALT/TAB keys. This enables a number of programs to run and the students to move between them. Observation suggests four main ways in which this technique is used.

The most frequently observed use of this technique is when students switch between programs and applications as part of the task - with a spreadsheet and a word-processor; a web page, a word-processor and a presentation program or between a document and a CD-ROM.

Another use is cited during homework, particularly coursework for GCSE. Students will have a number of tasks open, and switch between them as they become tired, or become stuck.

The third use is an extension of toggling between programs, where they will switch from the tasks to a game, and then back again. These uses all demonstrate the way in which students move from full engagement with the task (and learning) to a state of reflection. Whilst this reflection may take place during a period of 'tinkering' with the text, by changing fonts and margins, running the spell-check and other utilities, it also takes place whilst the student engages with other tasks, or plays a game.

The final use of switching is between licit and illicit activities, when students are expected to be on task but occupy themselves instead with the maintenance of their web site, speculative surfing or with interactive chat rooms. The most ingenious collective use of the ALT/TAB facility was with a class which was being taught Excel spreadsheet routines. The teacher was demonstrating the program and the tasks the students were expected to undertake. The students were using their own chat program to carry on 'conversations' totally unrelated to the lesson. When the teacher asked a question, or moved around the room the student would ALT/TAB from the chat to the spreadsheet (Abbott, 1998). It might be argued that multi-tasking is merely the material form of an activity that has always taken place. What the computer offers to the user, however, is the prospect of simultaneity, however much of a simulation that might be. Simultaneity becomes embodied, both within the computer and its user. As Gardner has commented,

> The invention of the computer has provided a powerful if ever-changing model of cognition and an invaluable tool in simulation, data analysis and conceptualisation of the human Mind.
>
> Gardner (1993, p.41.)

This use of the computer as a metaphor for the human Mind and cognition is one that is explored in the next section.

Learning styles

Learning styles are the different ways in which individuals think and learn. These become formalised as expectations and behaviour, which the individual then brings to the task of learning. The stages of learning can be separated into three broad areas: cognition, the acquisition of knowledge; conceptualisation, the processing of knowledge and the affective factors related to these. The focus is therefore on the process of learning.

Kolb (1984) saw learning as an active process. Its stages formed a continuum, from concrete experience: (involvement); reflective observation, watching others or developing observations about one's own experience; through abstract conceptualization: the creation of theories to explain one's observations; to active experimentation, using theories to solve problems and make decisions.

Gardner (1983) identified different types of learning, particularly those characterised as 'know-how' and 'know that'. From that he defined 'multiple intelligences', to describe the different ways (and combinations of ways) in which individuals learn. Learning can be seen as 'playing' with different capabilities: the verbal/linguistic; logical/mathematical; visual/spatial; musical/rhythmic; bodily/kinesthetic; social/interpersonal and personal. This perspective provides an immediate rationale for the use of computers by young people: the combination of play elements – the ludic – the use of language as part of the process, together with visual stimulus, means that the computer provides a focus for different types of learning.

Some, however, assume that the young learner - a child - is not the same as a mature learner - an adult, and that the learning styles must be different (Knowles, 1970). Adult learners are often characterised as autonomous and self-directed; goal oriented; problem centred and needing to know why the learning is taking place. Adults are seen as practical problem solvers, able to draw on accumulated life experience. The young learner, the child, is assumed to possess few, if any, of these characteristics. Many of the assumptions implicit in classroom praxis are predicated on this dichotomy.

Learning strategies for adult learners have been grouped in binary terms by Felder and Soloman (1998). They have re-worked Gardner's concept of multiple

intelligences into descriptions of active and reflective learners; sensing and intuitive learners; visual and verbal learners and sequential and global learners. Indeed, Gardner comments that

> …intuitive theories remain as pre-potent ways of knowing and are likely to re-emerge with full force once the person leaves a scholastic milieu.
>
> (1993, p.86)

The point is made that computers are artefacts that reinforce intuitive understanding and ways of knowing and learning. This perspective places computers as tools, external to, although enhancing, cognitive processes and development.

Multi-tasking and learning

This research has indicated the diversity of approaches utilised by students when working with computers. Further, the extent to which students use them for work illustrates the ways in which the computers are not simply artefacts that reinforce intuitive understanding and ways of knowing, but rather an integration with the understanding and the thought processes. Knowledge is therefore constructed by the learner, as part of the work process.

If the picture of an adult learner is one of someone autonomous and self-directed; goal oriented; problem centred and needing to know why the learning is taking place; a practical problem solver, able to draw on accumulated life experience, how is that different from the way in which young (child) learners work with their computers? The opportunities for learning commonly applied to adult learners, those of case studies, role play, simulations and self evaluation are precisely those through which younger students learn when using their computers.

Multi-tasking cyborgs?

What differentiates computers from previous technology to which students have had access, such as cassette recorders, calculators or VCR machines is that both the software and hardware offer a seemingly endless range of possibilities. Whether the student is an active or reflective learner; a sensing or intuitive

individual; a visual or verbal learner and sequential or global learners, the way in which the computer is used will reflect that. The active, visual, intuitive and global nature of multi-tasking is likely to develop those particular styles of learning. Conventional educational pedagogy has been superceded by learners who have constructed the active, goal-directed learning patterns previously associated with adults. The integration of computers with the individual's understanding and thought processes will create new ways of thinking.

The cyborg of Clynes and Kline constructs itself with every new piece of work. The student and her computer form the man-machine system, the hybrid, the cyborg. The operating system and the programs perform the routine checks and monitoring, checking, correcting, formatting, saving the work. The student is set free from her limitations, to create, to think and to explore a range of possibilities.

Just as long as she is one of the 80% with access to a computer at home.

Snapshots and surprises

By the time I had finished this section I felt that I had identified a pattern of working that a significant number of students were adopting. I had almost five thousand responses to surveys over a four-year period. The problem was whether the themes emerging from student responses were simply descriptions of behaviour, or whether there was a more fundamental change. In part, it was the problem of the Uses and Gratifications approach to data collection, and the tracking of responses in percentage terms. What I still lacked was the evidence that the students as cyborgs were using their computers as the tools to set them free.

I had assumed that the most immediately apparent impact of computers on student work, the ability to handle, manipulate and present data within documents, would be the factors that would have increased. I had some ten years of student work to analyse. Whilst my assumption was true for the first three or four years of the work sample, there was no significant increase in the evidence beyond this point.

It was as if those students whose approach to work was analytical and systematic were able to produce more of it, and those whose limitations held them back from producing this type of work had been facilitated by computers.

After that, more students were using computers, but for different purposes, in different ways.

The rapid take-up of computers by students had certainly changed what they did; it had changed the ways in which they talked about computers and work. What was more problematic, however, was whether or not they had changed the ways in which they thought. I decided to investigate the ways in which students conceived of the Mind: I felt that their responses might enable me to identify the influence of computers on their thinking.