A Study of Young People's use of ICT in domestic environments: an Activity Theory Perspective

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Abstract

This study examines the learning of Information and Communication Technology (ICT) skills by young people in domestic environments. The theoretical framework is based on Cultural Historical Activity Theory (Cole, 1996; Engeström, 1987;Nardi, 1996) and it is used to examine the ICT activities occurring in young people's homes. The study is about both the exploration of home ICT use and the 'exploratory tools' used as well; it is an experiment, therefore, in the practical application of Activity Theory. The thesis uses Activity Theory to examine how a group of individuals engage with ICT; it also uses this theoretical perspective to inform the interview questions and the subsequent formulation of a framework for data analysis.

The primary focus is on the interactions, contexts and opportunities for learning afforded by the home environment. The thesis explores the claims that 'young people learn ICT in their homes'. The interviews suggest that young people engage in a very wide range of 'exotic' tasks and activities and that the skills necessary to undertake these are 'picked up' as and when required. Activity Theory is used to help clarify the complex interactions involved in learning in these contexts.

An analysis of the interviews reinforces the view that home-based ICT is very different to school-based ICT. Young people overcome the problems and pitfalls encountered during their everyday engagement with ICT by accessing a variety of artefactual resources resulting from other Activity Systems. The study also looks at how the affordances of the young people's environment can offer a range of learning opportunities. The interviews also suggest that in these contexts, young people will learn only if there is a perceived need and establishes that due to the nature of the technology currently in use, a certain level of technical expertise seems to be an important prerequisite.

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Chapter 1: Introduction – setting the scene

This study examines the learning of advanced, or 'exotic' (Downes, 1999), Information and Communication Technology (ICT) skills by young people. The primary focus is on the interactions, contexts and opportunities for learning afforded by the home environment. The theoretical framework is based on Cultural Historical Activity Theory (Cole, 1996; Engeström, 1987;Nardi, 1996) and it is used to examine the ICT activities occurring in these contexts.

1.0 The focus of the study – learning ICT in the home

It is true that a great many young people seem to enjoy a natural predisposition for technology and much of the time seem to learn its use without any formal teaching taking place (e.g., Papert, 1996; Downes, 1999; Cuban, 2001; Mitra and Rana, 2001; DfES, 2002b-biii; Sefton-Green, 2003; Selwyn and Gorard, 2004; Buckingham, 2005). The conflation of ICT with the notion of 'play' and its configuration as something 'playable' (Downes, 1999) may have some causal effect on this perception. Informal conversations with children and observation of young people's activities would seem to confirm the claim that they have somehow 'taught themselves'.

The thesis poses three principal research questions related to the nature of ICT use by young people in the home. Two are related to the use of ICT in the home and the third is linked to the researcher's search for a suitable theoretical lens. These are:

1. "What is meant by claims that 'young people teach themselves ICT in their homes?
2. "How do they learn?"

3. "How do we find out?"

The search for an appropriate theoretical perspective from which to explore ICT use in the home constitutes the third research question since, for the researcher at least, it forms a significant part of the personal learning and development that this thesis has engendered.

As with any other single question, other subsidiary questions soon arise. Asking someone "Are you cold?", for example, may require a simple 'Yes' or 'No' but, more often than not, will generate other related questions about blankets, air-conditioning or even cups of tea. Some answers, in turn, will give rise to other questions; this is precisely what occurs in this thesis. The questions that arose as a result of the inquiry and which served as a guide to thinking were:

a) "What do young people actually do with ICT in the home?"
b) "Is home-based ICT different to school-based ICT and, if so, why?
c) Is there anything about the home environment that is conducive to learning about ICT and its use?
d) Is there anything about the nature of the ICT tools used that help or hinder learning?
e) Can we apply what we learn to the school environment?

The principal research questions arise as a result of a concern with the existence of a significant body of evidence suggesting that the home environment may be capable of providing many children with opportunities for learning that schools, for a variety of reasons, cannot compete with (e.g., Selwyn, 1998; Downes, 1999; Facer et al.,2000; Furlong et al.,2000;

Mumtaz, 2001; *Impact2*, 2002bii; Buckingham, 2005; Somekh and Pearson, 2007). Wellington (2001, p.238) goes as far as to suggest that such is "the access and availability of ICT in homes" that even the statutory requirements outlined in the National Curriculum programmes of study for ICT (DfEE/QCA, 2000) may be met (*ibid.*). This was borne out, at least in part, by one of the periodic, Ofsted-style inspections (Gibraltar Department of Education and Training, March, 2001) of ICT in one of Gibraltar's two secondary schools. The inspectors point out that whilst attainment at Key Stage 4 is above the UK average, it is only because of the availability and use of "the pupils' own resources" (*ibid.*, p.4). They also comment:

> ...pupils are frustrated by the fact that they do not get regular opportunities to develop the skills they have obviously acquired by using computers at home.
>
> (i*bid.*, p.6)

Another survey (Gibraltar Department of Education and Training, December, 2003) suggests that the types of experiences enjoyed by a large number of local 12 to 18 year olds are far more sophisticated and technically-oriented than those afforded by the school curriculum. Furlong et al. (2000, p.108) suggests that the home affords important advantages over schools in this respect. They (*ibid.*) conclude that it is difficult to teach ICT within the contexts and scenarios offered by traditional schooling and argue that it is instead the home, where vital ICT learning is located (*ibid.*, p.108):

> What is worrying is that there is every reason to believe that it will be these skills and strategies rather than those promoted in schools that will be essential for the success of our children in the new millennium.
>
> (Furlong et al., 2000, p.108)

Information and Communication Technology (ICT), for the purposes of this thesis, refers to the use of personal computers, peripheral equipment such as scanners, CD-ROMS, DVD / CD re-writers and printers; the internet and related application software such as e-mail, the world-wide web and communications software; 'office' software packages such as word-processors, spreadsheets, databases, and so on.

An important aspect of this study is also that whilst there is an extensive body of literature that clearly demonstrates a preoccupation with the use of ICT to support existing school curricula and subject-based learning, there is correspondingly very little that deals with the learning of ICT skills *per se*. This is articulated in terms of the specific technical 'know-how' required to fully understand and engage with these technologies.

The study is realised in an extremely small, relatively affluent community where a high proportion of young people have access to ICT equipment. Many of the socio-economic factors at play in larger territories are present, albeit on a correspondingly reduced scale. An explanation of the context is provided in Appendix 1.

1.1 ICT and education: a contextual overview

> The rhetoric of the 'information age' is persuasive, promising, as it does, a new democracy where participation is enabled through technologies which simply require the modern citizen to be computer literate and connected to the internet...
>
> (Hutchby and Moran-Ellis, 2001, p.4)

The unrelenting convergence of telecommunications, computing and the media industries along with the ever increasing conversion of information into digitally accessible formats from governmental information and processes to 'e-commerce', 'on-line banking', 'e-learning' and education has created what Facer et al (Facer et al. 2001b, p. 91) call the 'new capital' of information and knowledge, accessible via the use of Information and Communications Technologies. Over the last two decades or so, the migration of what were once specialised, niche technologies into the public domain, coupled with the development of the 'World Wide Web' and other internet services have not failed to have a significant impact on policy-making around most of the world.

Pachler (2001, pp.15-16), writing about ICT in school, notes that access to and the ability to manipulate information are fast becoming very important preconditions for success in economic, political and personal terms. The ability to access, adapt and make critical use of both the technology and the information this provides access to is central to the production of wealth and power. The Organisation for Economic Co-operation and Development (OECD, 2001 *Learning to Change: ICT in Schools*) posits, along very similar lines, that there are extremely strong economic, social and pedagogical rationales underpinning the inclusion of ICT in education (OECD, 2001,

p.10). These rationales are inter-related and can serve to illustrate not only the different emphases normally afforded to ICT in educational settings but the reasons behind the way ICT has been introduced and used in schools.

Tony Blair (cited in *Transforming the way we learn*, DfES, 2002a, p.4) for example, neatly encapsulated these three arguments for the use of ICT:

> Used well [digital technologies] have the potential to improve achievement in our schools and colleges, to boost the prospects of British industry and commerce, to offer opportunities to all learners, particularly those who would otherwise be excluded, and to significantly enhance our quality of life...
>
> Tony Blair, Prime Minister (DfES, 2002, p.4)

Of the three main rationales, the economic one, would seem to be the most powerful and persuasive for it directly links ICT to success and prosperity. ICT is seen as the engine providing the motive force for the new knowledge-based economies of the 21st century hence the extreme politicisation of ICT policies in most countries. Somekh (2000, p. 20) points out that that this politicisation is based on understandable aspirations: "no less than the solution to fundamental, educational problems" (*ibid.*) such as providing individualised learning, the raising of achievement for all and to provide "high quality mass education at a cost the country can afford" (*ibid.*). This has also been echoed by the DfES more recently (DfES, 2004) in as part of the 'Personalised Learning' agenda for pupils in England and Wales.

The 'social' rationale (OECD, 2001, p.10) bases itself on the argument that ICT literacy is a requisite and failure to become fully conversant with the technologies will exclude individuals from a rich and full participation in society and the workplace. The third rationale, (*ibid.*) the pedagogical, is

based on the perceived potential of ICT to transform teaching and learning and address all sorts of issues from special needs and disaffection to the development of higher order thinking (*e.g. vide Papert, 1996; DfES, 2002a*).

Considerable policy commitments have therefore been made by a large number of countries recognising the importance of information and communication technology, for example, the United States' $2 billion 'Technology Literacy Challenge', the £1 billion 'National Grid for Learning' in the UK, the DM160 million 'Schulen ans netz' in Germany or the 'Educational Masterplan for ICT' in Singapore. In 1997 the UK Government announced its plans to encourage a more widespread and consistent application of ICT in teaching and learning in state schools. The main thrusts of the initiative were to equip schools with more modern, state-of-the-art facilities, the creation of the National Grid for Learning (DfEE, 1998, *Open for Learning, Open for Business – the NGfL Challenge*) culminating in Curriculum on-Line (launched officially by Charles Clark, January 9th 2003, BETT, London) which would facilitate access to educational information and high quality materials over school-based networks and the internet along with the organisation of in-service training for teachers and support staff.

It is also interesting to note that since the implementation of 'Curriculum 2000' in September 2000 (DfEE & QCA, 2000), the use of ICT became compulsory across all subjects, effectively making it part of the 'core' subjects thus affording it the same status as English, Mathematics and Science.

There is little doubt that information and communication initiatives in education have been positioned within the discourses of the 'information age'

and the 'computer revolution'. The discourse of the 'information age', Castells (1996, p.21) reminds us, refers to the notion of a society in which:

> ...information generation, processing and transmission become the fundamental sources of productivity and power, because of new technological conditions emerging in this historical period.
>
> (Castells, 1996, p.21)

This view would still seem to remain valid and remains at the core of present discourses in favour of ICT and its importance to modern society. As a result, the expectation of this 'information age' and a natural fear of exclusion has convinced, some would even argue, coerced, both public and private sectors into investing heavily in information and communications technology infrastructures. Selwyn (1999, p.66), in fact, points out, that the ideology of the 'information age' seems to have instilled a "common sense consensus" (*ibid.*) amongst parents, students and teachers that they have to adapt and embrace the 'information age' and its technologies or face becoming one of the 'information poor'. The adoption and implementation of ICT in education is seen as the result of a kind of 'technological determinism' described by Facer et al. (2001, p.92) as 'an uncontrovertible orthodoxy' in which the social transformation taking place is a 'unique model' to which all societies should aspire to, or conform.

1.2 The Gibraltar context

Bassey (1995, p. 72) describes the dangers of not providing a specific description of the location of any research study, not least because it helps emphasise the "singular" nature of the enquiry. Cohen et al. (2000, pp.137-

138) also make this point in their discussion of 'context' as one of the elements of "naturalistic" inquiry:

> ...behaviour and therefore data are socially situated, context-related, context-dependant and context-rich. To understand a situation researchers need to understand the context because situations affect behaviour and perspectives and vice-versa...
>
> (Cohen, Manion and Morrison, 2000, pp.137-138)

Cuban's (Cuban, 2001, pp.21-35) detailed description of young people learning with computers in Silicon Valley, for example, shows how extremely important a full understanding of context and background really is. A similar study set in another location would simply not have been the same; the fact that it was undertaken in a technologically-rich environment such as Silicon Valley, clearly affects the interpretation of the findings in significant ways.

It is important then to locate this study within its context if we are to completely understand it. The Department of Education and Training, under the control of the Director of Education and Training, is charged with responsibility for the day-to-day management and control of everything that goes on in schools and the college. For political, cultural and historical reasons, the education system in Gibraltar has adhered very closely to that of the UK. It is based, primarily, on the 1974 Education Act (Gibraltar), which, in turn, is based on the 1944 Education Act (England) and the Education (National Curriculum) Regulations (Gibraltar) 1991. The latter, as did the 1988 Education Reform Act in England and Wales, effectively determines what every pupil is entitled to learn at school, irrespective of the school attended.

All curricula in the schools are governed by the local National Curriculum Regulations and children in Gibraltar are taught the same subjects,

in the same way, as are children in English schools. The local National Curriculum is derived directly from the National Curriculum for England and Wales. English is the language of instruction throughout although under certain circumstances relating to special needs and work with children in the Reception Year, Spanish will sometimes be used in First Schools. The core subjects are English, mathematics and science and, mirroring similar developments in England, ICT is part of the 'extended' core. The foundation subjects are design and technology, information and communications technology, physical education, Spanish, art, music, history, geography, and a modern foreign language other than Spanish (this is normally French but interest in Italian is on the increase). Religious education is included but is subject to the same rules and regulations as in England and Wales. The only concession to the bilingual nature of the community is the inclusion of Spanish, albeit as a "foreign" language, in schools as from Year 4.

There are no higher education institutions in Gibraltar. All teacher-training takes place in UK universities and colleges. In addition, teachers must have a registration number issued by the DfES (UK) and have gained Qualified Teacher Status (QTS) before they are allowed to practice in any government-run school in Gibraltar. Teachers have parity of pay and, where it is deemed applicable, working conditions with the UK. The majority of teachers are members of one of the larger British teacher unions (NASUWT).

There are fourteen government schools and one College of Further Education in the territory catering for a total population of just under 5000 children and full-time students. The local Education system tends to adopt and

adapt many of the initiatives and practices found in English schools if they are deemed to be "good practice" but is not bound by legislation to do so.

All schools carry out internal analyses of individual and group standards, usually using UK standardised tests. Gibraltar "national" standards compare very favourably with the UK, with pass rates at GCSE and at AS and A Levels being, more often than not, above UK averages. Standards in England are used as a comparative measure and are generally perceived as the territory's only point of reference.

1.3 The researcher in context

It is equally important to contextualise the researcher as well as the research itself. In this particular case, the researcher is a 46 year old male, an English teacher by profession and the Senior Education Adviser for the Gibraltar Government Education and Training Department. Information and Communications technology, computers in particular, have long been an interest, ever since the BBC microcomputer first appeared on the educational scene. The writer is self-taught when it comes to ICT and most of this learning took place in the home. He maintains a healthy cynicism in relation to traditional discourses advocating the mass introduction of ICT into schools and has always recognised that there is a dichotomy between the way children and young people actually engage with ICT and the expectations and assumptions inherent in school-based ICT.

The ability to be both reflective and reflexive in relation to one's practice as an educator has always been an important element underpinning the writer's professional life. One of the prevailing characteristics of this practice has been the precept that there is much more to teaching than the

transmission of 'information'. The 'understanding' and the meta-skills required to 'learn to learn' are far more important than recall, drill and mechanistic instruction. Experience has shown him that one of the most important indicators of 'quality' in schools is to be found in teacher-pupil and pupil-pupil interactions; if these fail, the school will fail. The social processes of the classroom and indeed, the school, have always been an area of professional interest.

The writer's perception is that education is increasingly seen as a commodity that should be subjected to market forces and 'survival of the fittest'. The essence, the very 'soul' of 'teaching', is being ripped out by the imposition of governances that have led to the noticeable deterioration of the social relations within schools. This has been accompanied by a narrowing of focus, ever increasing attempts to micro-manage the teacher's work, along with a commensurate 'technicisation' and 'routinisation' of what teachers have to do. This is being resisted in Gibraltar, although external influences, in the form of colonising discourses and cultures, tend to counter initiatives which are deemed to be too 'different' from UK-led practices.

The writer's experience is that the human, inter-personal aspect of teaching and learning is being gradually eroded by new initiatives that seem to stem from issues to do with teacher recruitment, retention and market-forces. This is resulting in a curriculum that is perceived, more and more, as a pre-packaged, prescribed body of content that has to be 'delivered' to a group of willing recipients. Teaching is rapidly becoming something that teachers 'do' to children and it is treated as a series of carefully planned 'actions' and discrete 'steps' which, if followed assiduously, will result in the perfect lesson. This is

rooted in early Victorian notions of mass education with its baggage of assumptions and cultural norms and are more in keeping with the nineteenth century than the present. A major reason for this study is, in fact, related to the researcher's personal concerns about the way educational systems are in danger of evolving.

This study is as much about the researcher as is it about ICT and young people. It attempts to first illustrate the definition of certain concerns and then proceeds to show how the author goes about finding a means of exploring these concerns. It is not about finding answers, in the empirical sense; it is about finding a cultural and professional identity. This is something that will always be difficult where the contextual realities are, in effect, a series of 'cultural' dichotomies. The study is, to a certain extent, about academic decolonisation and about a community attempting to find its own way.

The thesis describes the researcher's own Activity System and how he draws from the various resources in order to 'teach himself'; in doing so, he has had to access the fruits of other people's minds and convert these into his own 'artefactual resources' by looking for new affordances. In the same way, the study tries to identify the strategies and resources that learners in domestic contexts exploit to serve their own purposes.

1.4 ICT in Gibraltar

There are some 15 businesses supplying computer equipment to the local community. To put this into some sort of perspective, there are only four main suppliers in the neighbouring Spanish town of La Línea with a population of more than 62,000. The assumption here is, of course, that if there were no

demand for computer equipment, these companies would soon go out of business.

Computer penetration in the community is high. As far back as 2001, the Gibraltar Census (Gibraltar Government Statistics Office, 2002) showed that approximately 75% of families with children already had a computer with an internet connection at home.

There are two Internet Service Providers (ISPs) in Gibraltar and between them they provide approximately 8000 or more internet accounts. At present domestic internet access for most homes is either by "dial-up" analogue telephone line providing a nominal 56.6K link to the ISP or a 'broadband' ADSL connection which provides domestic users with up to 2 Mb connection. All young people interviewed for the purposes of this thesis had access to the internet via broadband connection. Businesses are offered digital connections and "always on" leased lines for permanent, faster internet access along with, of course, higher charges. All schools have access to the Internet via similar broadband connections.

Home-based internet access in Gibraltar is also generally considered unsatisfactory in terms of bandwidth cost when compared with other European jurisdictions such as the UK or Spain.

1.5 ICT in Gibraltar schools

Since the early 1980s the Gibraltar Department of Education has been purchasing computer hardware for schools with the Sinclair Spectrum being the machine of choice. Early machines such as the BBC/Acorn microcomputers also proved to be successful. They were also easy to use and proved to be a reliable platform upon which to run educational software. For a

relatively long period of time schools in the territory had all the hardware and software necessary to fulfil the initial National Curriculum requirements for Information Technology. Although technical support was sometimes required, it was the kind of thing teachers soon became used to undertaking themselves given the relative stability of the platform.

The move towards more sophisticated hardware, namely, the IBM compatible Personal Computer (the PC, which has become the de-facto industry standard in Gibraltar, the UK and most of Europe) gave rise to problems: using and deploying computers, especially in school settings, was no longer a straightforward affair. The flexibility of the platform obviously requires a certain level of expertise on the part of the user.

The purchase of computer equipment is also carried out centrally with the Department of Education having to submit to a tendering and bidding process on an annual basis. Although a substantial number of computers are bought every year these have to be used to replace obsolete equipment. The outcome is that schools find the present local ICT scenario unnecessarily restrictive (Report on ICT in Gibraltar Schools, February, 2004) and find it *difficult* to meet all of the National Curriculum requirements mainly due to a lack of adequately maintained computer facilities and usable workstations (ibid.). The report found, however, that by February 2004, all local schools had at least one or two computer suites connected to the internet along with appropriate software, a variety of printers, digital cameras, digital projectors, scanners and other related equipment. The Department of Education & Training is embarking on a project that should see the purchase of Interactive Whiteboards and digital projectors for all schools by the end of 2009.

Encouraged by the number of number of computers already in children's homes and as a direct result of this research project, the Gibraltar Government has lowered the import duty on ICT equipment. At present computer equipment and software attracts 6% levied as import duty whereas other commodities attract a levy of 12% when imported into Gibraltar.

The personal computer is the core technology driving ICT and, for this reason, should not be ignored or taken for granted. For most users, its use as a tool is never completely unproblematic and an understanding, therefore, of the computer itself is vital if the issues of ICT use are to be fully understood.

Chapter 2: ICT capability and the personal computer

The term Information and Communications Technology covers a range of equipment: from fax machines and photocopiers to mobile phones, personal computers, personal digital assistants (electronic organisers) to games consoles. The personal computer, in whatever form or guise, is at the heart of ICT.

The IBM compatible machine has all but dominated the European market and is to be found in most European schools and homes, as opposed to the US market where the Apple Macintosh computer also has a substantial share. The IBM compatible personal computer (the PC) is the mainstay technology used for ICT functions in education, much of industry and in people's homes. The reason for this is to do with the completely flexible system architecture which has remained a feature since its original inception in the 1980s. It is possible to run a programme designed in the early 80s on a modern personal computer at the 'cutting-edge' of technology today but this compatibility comes at a price; this is of significance.

The flexibility of the basic technology behind the PC allows for a very wide variety of software to be run. It is quite normal for the user to watch films, send e-mails, access the internet, edit digital photographs and pictures, fax, word process, do some accounting, listen to high fidelity music and play an interactive game all on the same machine. This versatility also means that machines of exactly the same specifications can be found running the latest children's games in someone's home, drawing a graphical rendition of a formula for a GCSE mathematics lesson, monitoring lava flow at the foot of Mount Etna, producing a sophisticated, commercial print quality document or

providing a platform for home shopping via the internet. Paradoxically, the same flexibility in which the success of the technology is rooted, also gives rise to a raft of inevitable problems.

The PC tends to be marketed as an item of consumer hardware in much the same way as other domestic appliances. This creates the expectation that it should function in the same way as these other domestic appliances. A perusal of any documentation connected with the sale of computers will show that there is always a mention of technical support. In fact, this technical support has become a marketable commodity. This, as one of many possible examples, can be seen in the strategy used in a pamphlet distributed by British Telecommunications PLC (BT, 2002) in its marketing of personal computers and related technology. It is significant to note that a major selling point becomes, not the technical aspects of the equipment, but the availability of technical support from dedicated engineers. The following serves to highlight how complicated the technology is generally accepted to be, with points such as the following being major selling points:

- BT Home computing takes the hassle out of buying a computer.
- Stress-free installation and set up by a BT engineer.
- You are not on your own once you've got your computer
- We'll help you choose the right computer
- We'll install it and connect it.
- Service and support is part of the package
- Problem? No problem.

(BT, 2002)

The reality is that no matter what the marketing 'hype' may be, the PC is about the only commonly available equipment which can never be guaranteed to work 'straight out of the box'. Whilst it goes without saying that there have been tremendous improvements in software and hardware aimed at ensuring that personal computers become more 'user friendly', the state of current

technology is still such that a substantial knowledge and technical 'know-how' is still required on the user's part. The hefty manuals and guides supplied with software and hardware suffice as testament to this.

Computer 'unreliability', for want of a better word, supports a whole industry in the form of a vast number of books, web-sites, magazines, guides and related publications. It is significant that no small to medium enterprise could ever hope to operate without some sort of ICT support infrastructure and schools are no different. The NGfL Pathfinders report for the DfES (DfES, 2002f) makes the point that as teachers integrate ICT into their teaching:

> ...technical failures become more seriously disruptive and more technical help becomes imperative.
>
> (DfES, 2002f, p.29)

The implication here being that the teaching of ICT in schools is heavily dependant on access to technical support and the more implementation of new technology there is, the heavier this reliance will be.

It soon becomes clear that there is tacit acceptance in the ICT industry that operating and using personal computers, accessing the internet and using software is not as easy or straightforward as it perhaps should be. British Telecom (BT, November, 2002) for example, helpfully informed prospective clients that the vagaries of ICT technology are such that there is a real danger of falling prey to "Computer Rage":

> ...over 600,000 PC users in Britain have broken their home computer in a moment of frustration and 70 per cent of us have admitted to shouting, swearing or being violent towards our computer when it crashes, freezes or causes other problems...
>
> (BT, November, 2002)

In the same press release British Telecom (*ibid.*) announces the launch of a new website to support customers precisely because of the need for them to get the most of ICT technology "without needing to be a technology expert". The logical implication of this being that the use of the technology requires a degree of understanding of how it works, quite apart from an understanding of how to use it. Clearly, if usage of ICT technology is to be unproblematic, any notion of ICT Capability should at least acknowledge some sort of 'technical' capability as a requirement.

Research in the United States (Crawford and Toyama, 2002) suggests that there is little consensus on what actually constitutes ICT proficiency or how to go about assessing it. The Organisation for Economic Co-operation and Development (OECD) in Paris has expressed a desire to include ICT skills along with literacy and numeracy in their international assessments of students and adults. The OECD aimed to include ICT proficiency in the domains for assessment in 2006 in the Programme for International Student Assessment (PISA) but extended the timeline to 2009, given the complexities of the task.

The problem is compounded by the fact that definitions, as Cuban (2002, p.177) points out, of ICT 'literacy' can range from "knowledge of and skill in programming" and "being able to troubleshoot computer lapses or software glitches" to "knowing how to run popular software applications such as word processing programs and spreadsheets" (*ibid*). This technical proficiency is often taken for granted. It should be noted that definitions depending on the use of the term 'literacy', can be problematic and may create what Merchant (2006) terms 'a conceptual gap' since the use of 'literacy' here is metaphorical and generally refers to 'a rather hazily defined level of confidence

and experience in use' (*ibid.*) and not literacy, per se. The use of the term 'literacy' to denote general computer skills is avoided in the thesis, for this reason.

Whilst much is made of obtaining, manipulating, interpreting and communicating information, very little heed is paid to the acquisition of the technical skills required to master these enabling technologies. It is as if the mediating technology, the tool itself, were transparent and the information and communications processes it engenders and facilitates simply materialise in an unproblematic way.

The notion of ICT capability has to include certain technical competencies and understanding and it is evident that this cannot be ignored, as Davis et al. (1998, pp.22-23) acknowledge:

> ...the more complex the tool, the more arduous the process of learning its use: hence the huge amount of resources devoted to teaching children how to read, write and work with numbers... an element of technical skill will always be necessary to use a computer...
>
> Davis et al. (1998, pp.22-23)

Or, as they continue, perhaps more pointedly, "You have to learn how to use a knife to cut a notch in a stick." (*ibid.*). Lave and Wenger (1991, p. 103) frame this notion in terms of 'transparency' and 'invisibility', arguing that the invisibility of mediating technologies is necessary if proper focus on the subject matter is to be afforded. By implication then, those with recourse to a full range of advanced skills, i.e. those that are proficient in ICT will obviously not be hampered by the intricacies and 'opacity' of an un-mastered technology. Some of the competency frameworks arising in the United States, and currently being used in schools and colleges across the United Kingdom, as a result of

pressure from industry and commerce now include 'Computing Fundamentals' to ensure that learners find out how to solve problems and setbacks linked to technical problems arising from day-to-day use.

A survey carried out in Gibraltar (DE&T: December, 2003) for example, shows that some 60% of 12 to 18 year olds questioned (n=263) spent most of their time undertaking what could be broadly described as "exotic" or technically sophisticated tasks with ICT (Downes,1999, p.71). Building their own computers, troubleshooting software and hardware, downloading and compiling music, designing web-pages, playing networked games, programming, downloading and installing software, connecting themselves up with virtual networks over the internet, copying and distributing 'shareware' software were all common activities amongst those questioned. This suggests that in Gibraltar, at least, a great number of children and young people are ICT 'capable' according to their own definition of 'capability'. These young people are constructed as 'experts' by their peers and technical expertise seems to be perceived as being a prerequisite for ICT capability. Research in the United States (Venkatesh et al., 2002) and in Finland (Hakkarainen, et al, 2000), for example, suggests that computer aptitude amongst young people is heavily dependent on knowledge of computer processes and found that individuals considered to be experts by their peers and teachers all enjoyed superior computer skills of a 'technical' nature.

The very nature of the artefact, the personal computer, is a vital consideration that is often forgotten in discourses about ICT and its role in education. It is ironic that it may be the actual 'deficiencies' and imperfections of the meditational tool and its 'opacity' as an artefact that could be

responsible for facilitating learning instead of being an obstacle for many young people. Young people, their ICT use and the role of the domestic environment in providing a learning context t are the key concerns of this study and it is therefore important that we examine that the growth of home computer ownership and the research interests the phenomenon has generated.

Chapter 3: A review of literature: ICT in the home

3.0 The growth in home computer ownership

Wellington (2000, p.34) advises that research cannot take place in a vacuum and has to be located in the context of what has been done before. A literature review, then, should offer a panoramic view of what is already known in our own particular area of research. Clough and Nutbrown (2002, p. 18) explain that research must be "contextualised in terms of what other enquiries have claimed as findings" (*ibid.*) and it is normally the job of the literature review to do this. They (*ibid.*) also add that a critical discussion of the literature also helps to locate the positionality of the research and help explain where the study lies in respect to research in similar fields.

There is little doubt that home ownership of ICT equipment is an ever increasing trend across the US, Europe and Australia. In 2002, the DfES *Survey of Information and Communications Technology in Schools* (DfES, 2002, p.8) showed that the average number of computers in secondary schools stood at 155.6 whilst the average number of pupils per computer was 6. When compared to the data from two other surveys, one published in 2000 (*Survey of Schoolchildren's Use of Computers,* DfEE, 2000d) and the other in 2002 (*Young People and ICT*, DfES, 2002c) it soon becomes clear that ICT provision in schools lags behind the type of provision that seems to exist in many British homes. Already, in the 2000 survey, the majority of the school children questioned had access to a computer at home: 68% of 7-14 year olds and 70% of those in the 15-19 year old age group. In *Young People and ICT* (DfES 2002c, pp.10-12) it was found that 68% of young people aged 5-18 years in England had access to the internet whilst 81% had a personal

computer or laptop at home. The Impact2 study (Impact2, 2002b; 2002bii) also suggests that there is a steady increase in ownership of computers, a provision which schools will never be able to realistically match.

Facer et al. (2001, p.16) also reported a high incidence of home computer ownership amongst the children they surveyed. Earlier, Harris (Harris, 1999, p. 332), in a survey of 429 Year 9 pupils, found that more than 60% of those surveyed had access to at least one personal computer at home. In 1997, according to the *European Computer Literacy Report* (Olivetti,1997) commissioned by Olivetti personal computers, up to a third of British homes had a computer at the time of the survey. Wellington (2001, p. 235) puts the British scenario into perspective by estimating, at the time, that:

> Crudely then, the UK has about 750,000 computers systems in its schools compared with the very conservative estimate of 5 million in homes...
>
> (Wellington, 2001, p. 235)

In another study, Sutherland and Facer (2004), directors of the Bristol University *Interactive Education: Teaching and Learning in Digital Age* (ESRC:2000-2003) project, found that up to 88% of children and young people surveyed had a computer at home with 73% saying that they also had internet access at home.

The *Impact2* (DfES, 2002b) research project for the DfES reports similar findings and suggest that the percentage of pupils claiming to have a computer at home ranges from 75% at Key Stage 2 to 88% at Key Stage 4. In a more recent survey of research on learning with technology outside school, Sefton-Green (2004) reports that, in the United Kingdom, PC ownership could be as high as 76% in families with school-aged children.

This growth in ownership of personal computers is not of course just a British phenomenon. European Union statistics for 2005 (Eurostat, 2005) suggest that the presence of children is a major factor in households' access to ICT; in other words, families with children tend to have computers. This seems to apply to the more affluent members of the EU such as Denmark, Sweden, Iceland, United Kingdom, Ireland, Germany and France.

The issue of home ownership and use of ICT has also been the subject of much attention in the United States. The National Science Foundation, for example, commissioned a study entitled: *The Application and Implications of Information Technologies in the Home: Where Are the Data and What Do they Say?* (NSF, February, 2001). The findings are of relevance particularly because they suggest that home usage may actually surpass 'institutional' use in the United States as well. In other countries there is every indication that ownership is also on the increase, for example most of Europe (Wellington, 2001, p. 235) and Australia (Downes, 1999, p. 65). Selwyn (1998, p. 224) goes as far as to argue that the home, rather than the school, seems to be responsible for providing the primary ICT experience for a great number of students. A similar trend is evident in Gibraltar. A survey (Department of Education and Training, Year 7 and 11 Survey, December, 2003) of Year 7 and Year 11 children in Gibraltar schools (n=683) found that 547 (80%) had a computer at home. This survey also showed that ownership tended to increase with age. The percentage of children with computers at home rose from 75% at Year 7 to 86% at Year 11. A similar trend has been identified in the *Impact2* study, (DfES, 2002b, p.11) and there is some is evidence to

suggest that this is a parental response to the perceived demands of the GCSEs on children. This is summarised in table 1:

Year	No. on roll	Children with a computer at home	%
All Year 7 and Year 11 children	**683**	**547**	**80%**
Year 7 (M)	196	154	79%
Year 7 (F)	173	123	71%
Year 7 (M+F)	**369**	**277**	**75%**
Year 11 (M)	150	131	87%
Year 11 (F)	164	139	85%
Year 11 (M+F)	**314**	**270**	**86%**
All boys in survey	**346**	**285**	**82%**
All girls in survey	**337**	**262**	**78%**

Table 1: Yr. 7 and Yr. 11 children with a computer at home (Gibraltar Department of Education & Training, December 2003)

The children in the survey showed high levels of home ICT ownership: of all (n=683) the children asked the question "Do you have a computer at home?", 547 answered "Yes" (80%). Of these, 82% of the boys questioned answered that they had a computer at home compared to 78% of the girls questioned. There are, undoubtedly, gender issues when it comes to computer use (vide, for example, Downes, 1998; Facer et al., 2000; Mumtaz, 2001) suggesting that there are differences in *how* ICT is used and perceived, quite apart from any differences that may exist in relation to ownership or access. The only apparent gender issues arising as a result of this study is the fact that there were more boys than girls interested in collaborating with the researcher for this study.

3.1 What children and young people do with ICT in the home

Questions as to the nature of home-based ICT provision are inherently difficult to answer because the technology is prone to rapid change within very short time-frames. What may have been common practice a few years ago (say, the use of floppy diskettes) is fast becoming obsolete as new and better

technologies are introduced (the introduction of recordable DVD-ROM technology, for example). The constant development of more refined and sophisticated software, hardware and the advent of fast broadband internet connections means that there will always be a commensurate increase in the range and scope of ICT activities possible in the home.

As far back as 1985, the use of computers in the home already constituted a recognizable phenomenon prompting Dutton et al. (1985) to comment that:

> Already, nearly one of every six households has acquired some kind of personal computer, of which as many as 20 percent have a modem for applications of their personal computer that involve communications.
>
> (*ibid.*, p.5)

Significantly, predictions for the United States (*ibid.* p.5) augured that personal computers would be used increasingly "for more varied purposes in leisure and work situations". The work of Dutton et al. (1985), although not immediately concerned with children or young people, is, arguably, seminal in as much as it represents one of the first attempts at the establishment of a framework to underpin the examination of home computer use. In their model, Dutton et al. (1985, p.9) link their hypothetical 'Patterns of Usage' to a typology and classification of factors affecting the use of personal computers. The suggested 'patterns of usage' serves to provide a useful frame of reference, or baseline, for degrees of involvement with computers and ICT since it represents one of the first attempts at 'categorising' degrees of computer use.

In addition, they (*ibid.*) propose a series of factors and variables which they suggest shape the use of personal computers in the home. These are

(*ibid.,* pp.10-12) described as issues broadly connected to "Social Status" (e.g., education, income, gender, social class etc.); issues broadly connected to "Personal Attributes" (e.g., beliefs, attitudes, values etc.); issues broadly connected to "Socio-cultural Setting" (e.g., social networks in and outside the home) and issues related, again broadly, to "Technical Features and Human Factors" (features of hardware and software that encourage usage: the degree and nature of computer usage may be affected by access to more sophisticated games, for example). The identification of these factors and variables (Dutton et al., *ibid.*) to home computer use is something that runs through most of the major studies undertaken in this field. It is also possible to identify the early stages of an engagement with concerns ranging from 'affordance theory' to 'distributed cognition' and other theoretical stances that reflect similar preoccupations to those of Cultural Historical Activity Theory, the theoretical framework used to examine ICT use in this thesis (*vide* Chapters 4 and 5).

In the United States the 2001 analysis of the impacts of home computer and internet use, *The Application and Implications of Information Technologies in the Home: Where are the Data and What Do They Say?* (2001, p.5) identifies only two major works that concern themselves directly and primarily with children, young people and learning: Riccobono (1986) and Gianquinta et al. (1993). The NSF (2001) study shows that whilst most studies examine the socio-cultural aspects of home-computing within the family (for example, Bird et al. 1990; Wheelock et al., 1992), few directed their attention exclusively at children and young people, therefore making these two studies significant landmarks in the field.

The Riccobono (1986) study examined out of school, or 'informal', learning activities and did not concentrate solely on computers but included video, print, audio as well as the newer, emergent computer technologies of the eighties. The main findings of relevance here are that children were more likely to use computers for learning than adults and that individuals who preferred to study on their own were far more likely to use computers for learning than those who preferred other learning styles.

The other major US study, (Gianquinta, Bauer and Levin, 1993) conducted during the eighties and published in the early nineties, based itself on a substantial number of case studies in relation to home computer usage. Significantly, this study identified games playing as children's main computer based activity and found very little 'academic' usage related to 'learning' (*ibid.* p.35) defined as activities which supported the learning of school subject matter. This study served to establish the notion of the 'social envelope', the expectations and overall perspectives that surround a technology. Gianquinta et al. (1993, p. 136) point out that:

> ... without serious attention to the shape of the desired envelope, a technology will not be used in its most innovative and promising ways except by chance, especially at the beginning.
>
> (ibid. p.136)

Overall, they (*ibid.*) found a complex series of social determinants which militated against the use of computers for what they described as 'academic use' of information technology: parents, for example, were rarely equipped to "model, coach or scaffold" (*ibid.* p.69) and conclude that existing family patterns and structures prevailed and served to either push children towards or away from computer use for educational purposes (*ibid.* p. 95). This 'promise'

of technology was (and arguably, still is) couched in techno-deterministic discourses that assigned technology a role that would facilitate children's learning or academic achievement at school and that home computers would empower parents to educate their children independently of the school. They identified an important dichotomy evident in 'learning' versus 'playing' and explored the socio-cultural context of the home and how it affected the very different ways in which children and parents perceive technology.

The researchers argued that any cultural innovation had to be accompanied by a compatible 'social envelope' if it is to succeed. Papert (1996, p. 153) and Cuban (2001, pp. 96-97) for example, have also argued that a sea-change in the way technology is perceived, and therefore used, has to occur if there is to be a 'real' technological revolution. More recently, this notion is reflected in the results of the *Impact2* (2002biii) which suggest that in 2002 the use of ICT in schools was still perceived by many teachers as something that is to be somehow 'bolted on' (*ibid.*, p.13) to existing practice, an extra tool in their toolbox that allows them to do more of the same, only perhaps faster. Again, this is a reference to the need for a change in the 'envelope', both social and cultural.

The extent of the actual *range* of the applications used for ICT in the home will always be difficult to categorise since different surveys report in a variety of ways and use different terminology to describe ICT activities. Most major studies (for example, Downes, 1998; Harris, 1999; Livingstone and Bovill, 1999; Facer et al. 2000; Mumtaz, 2001; DfES, 2002b;) show that, without question, games playing is the most popular computer activity in the home. It is also clear that after games, word-processing is reported as the

most common use for computers. There are of course, other activities, occurring in the home and these are sometimes related to school-based, 'academic' use of ICT such as word-processing, using a spreadsheet or database, or looking for information on the internet.

UK-based surveys and projects, (Selwyn, 1998; Harris, 1999; Livingstone and Bovill, 1999; Facer et al., 2000; Sutherland and Facer, 2001; DfES, 2002c), suggest that children use ICT in similar ways. Selwyn (1998, p.219) for example, lists the range of activities as follows: word-processing, games, art/drawing, databases/spreadsheets, programming, internet, e-mail and miscellaneous. Selwyn (*ibid.*) found there to be a significant difference in the use of computers by boys to that of girls, with boys seeming to benefit at greater levels from using a home-computer than girls (*ibid.*). The frequency of use for the different applications of ICT also tended to differ between boys and girls with more use seen by boys than girls. Overall, Selwyn (*ibid., p.211*) reports that "access to, and benefits gained from, home computers were found to differ significantly according to students gender". Harris (1999, p.336) came across very similar finding in her survey of secondary school children. The activities listed by Harris (*ibid.*) are also similar: games/adventures, word-processing, creative arts (e.g, music, graphics), spreadsheets, desktop publishing, information handling (databases), CD-ROMS and 'miscellaneous'.

There were significant gender differences and Harris (ibid., p.331) reports boys as having better access to home computers and using them more frequently. Higher numbers of boys in the survey (*ibid.*) tended to play more games, more frequently than girls, who in turn spent more time word-processing than boys. Harris (*ibid. p. 337*) observes that the most widely used

applications were games/adventures and word-processing and that it would seem likely that these two applications represented "leisure- and school-related activities" respectively. In other words, Harris (*ibid.*) suggests that computers in the home are used for either playing games or for doing school-related work.

ScreenPlay (Facer et al., 2000) identified much the same trends amongst children up to the age of 15. *Screenplay* (*ibid.*) lists ICT activities in more detail than the two previous studies and attempts to provide a picture of the range of ICT activities carried out by children. In this study, predictably, games prove to be the most popular activity with word-processing a close second. The types of computer-based activities listed by Facer et al. (2000) in *Screenplay* were: Games (81%); Word-processing (81%); Desk-top publishing and other design based activities (63%); encyclopaedia use (52%); computer management and personalisation (39%); educational software use (31%); web browsing (28%); e-mail/chat rooms (20%); animation (17%); computer programming (10%); web production (9%).

3.2 Looking beyond a 'school-centric' approach

Whilst this may provide some idea of the *range* of computer activities undertaken in the home, it will be obvious that any attempt at categorising home-based ICT using personal computers as the base technology will be immediately problematic. Drilling down into the real nature of home computer use by children and young people is difficult, to say the least, due in large part to the immense variety of possible uses. Mumtaz (2001, p. 353) for example, divides computer activity into the following categories: games, e-mail, web-browsing, drawing, word-processing, 'Encarta' and 'CD-ROM' and compares

school-based use against home-based use of these same applications and activities. A common underlying theme in these studies is the assumption that home- and 'out-of-school'- based use must somehow mirror school-based use if the former is to be linked to fruitful 'learning' and 'educational usefulness'. The problem, as Merchant (2006) points out, is an underlying assumption underpinning much of what goes on in schools; 'digital literacy', for example, in terms of written on-line conversations and interactive texts gain educational status only when they are deployed in the pedagogical, school-centric routine called 'literacy'. This assumption is under scrutiny and is the subject of academic debate (*vide* for example, Sefton-Green, 2004; Buckingham, 2005; Merchant, 2005; 2006).

School-based practices, then, are almost always used in these surveys as a baseline against which to compare ICT usage. This provides a rather restricted perspective from which to view computer and ICT usage given the body of evidence that points to the need for a radical re-think and change of 'envelope' (Buckingham, 2005; McCormick and Scrimshaw, 2001; Crawford, 1999). The initial findings of the on-going PERLS project (Somekh and Pearson, 2007) also suggest that the ICT pedagogies, of schools in England at least, require refreshing because of the massive differences that exist between what children do in their homes and what goes on in schools.

Attempts at reproducing and 'relocating' Gianquinta's (Gianquinta *et al.* 1993) research: *Beyond Technology's Promise: An Examination of Children's Educational Computing at Home* (Gianquinta et al., 1993) meet with very much the same sort of results because they frame their enquiry from a similar perspective. The promise of 'educational computing', purportedly, is

based on the notion that children's use of home computers would substantially enhance their academic achievement in school. Sometimes this 'school-centric perspective' is quite explicit, as Kerawalla and Crook (2002, p. 752) admit of their own research project:

> We consider new technology only in terms of its status for reproducing school-like activities in a home-school setting. This entails no prejudice as to the inherent quality of classroom learning...
>
> (*ibid.*)

They (*ibid.*) continue, almost apologetically:

> However, our research emphasis at this point certainly responds to the direction of much popular and political discussion in this arena...
>
> (*ibid.*)

This means, essentially, that little of the much vaunted 'promise' of technology seems to be unfolding and it is therefore significant that Kerawalla and Crook (*ibid.*, p.768) find, despite parental and social aspirations to the contrary, that home ICT is rarely 'continuous with school concerns' except perhaps for delivering 'formal homework tasks' (*ibid.*). Gianquinta et al (1993) use the concept of a 'social envelope' as the total configuration of the expectations accompanying the adoption of technology. Unless this envelope is modified, the technology will be used in ways that conform closely to existing purposes and expectations: a computer, thus, remains a glorified type-writer, an Interactive Whiteboard a glorified, overhead projector. In fact, the InterActive Project (2001-2004) found that despite the UK government's £1 billion commitment to increase the use of ICT in schools, the development of ICT in schools remained sporadic and disappointing. The situation, they also report, is much the same in the rest of Europe.

The *Impact2* report (2002bii, p.10) explains that for children of secondary school age, word-processing and the Internet were the most common resources used to support school learning. It does, however, go on to use case-studies to provide a richer, more detailed illustration of the exact nature of home-ICT use. The fact is that ICT activities are seldom undertaken in isolation. It is quite conceivable that during a word-processing session children would also be engaged in collecting and collating information from a DVD-ROM or the internet, adding drawings and pictures to their documents whilst listening to music which they have copied or downloaded: all of which require different abilities and skills. Word-processing is much more than just 'typing' using a computer and any use of the term should really reflect the complexities of the activity.

Sutherland and Facer (2002, p.3), team members of Bristol University's *InterActive Education Project: Out of School uses of ICT,* point out, that before we can understand the role of ICT in young people's lives, there is a need to move beyond "a simplistic mapping of ownership" and look into the "specific activities young people are involved with" when using ICT.

The *Impact2* (*ibid.*) study, in this respect, does show that children and young people do much more than a rather 'sterile' list of activities and would seem to suggest that it is looking beyond its DfES/BECTA led research brief of examining the effects of ICT on attainment. The *Impact2* (2002bi, p.3) study, finds, incidentally, a positive relationship between raised attainment and ICT use for *some* subjects. This seems to represent a major concern in most of the recent research projects, where what is *really* being examined is how ICT can extend the school-based learning environment into the home. There is a

danger of becoming too focused on what goes on in schools to the extent that home-based ICT will be 'weighed, measured and found wanting' if it is looked at from a purely 'school-centric' perspective. Any attempts at linking what goes on in schools to children's use of ICT in the home leaves the door open for the summary dismissal of home-based ICT as somehow not having academic rigour. Moseley et al.(2001, p.45), looking at computers in the home from a purely attainment-led perspective, conclude:

> Our conclusion is that schools have not yet found, even when well resourced and striving for best practice, ways of using computers which make much difference to pupil performance in maths and reading.
>
> (*ibid.*)

But because there were no measurable gains in these curriculum subjects, they are forced to conclude, in a most extraordinary statement, that:

> Giving pupils greater freedom to use computers in schools in the same ways as they use them at home is unlikely to make any difference...
>
> (*ibid.*)

This lends weight to the argument that until ICT use in the home is examined in the light of its own intrinsic worth - and not from a perspective anchored firmly in school - understanding the extent of the skills-base actually utilised by children and young people in the home will be difficult.

Problems obviously arise when ICT use is viewed from a purely utilitarian viewpoint. As soon as the use of ICT is linked to progress in other subjects of the curriculum, there is an immediate danger of it being perceived as being simply a 'tool'. The authors of the *Impact2* study (DfES, 2002bi), for example, warn (*ibid.*, p.43) of the dangers of taking this approach, the implications being that ICT is merely 'useful' and not much else. A substantial part of what are

shown to be 'typical' computer activities would seem to have little do with National Curriculum ICT and there is a danger of these being dismissed as having no 'educational' value. For example, the *Impact2* study (2002biii, p.34) found that teachers commonly felt that some sorts of ICT activities undertaken in the home could be counterproductive, citing the example of 'inappropriate keyboard skills' (*ibid.*) when surely the important factor, that ICT was being used in the home, is missed. It is the same as taking the stance that reading comics is *a bad thing* rather than accepting that any reading *is better* than no reading.

Even seemingly 'inappropriate' skills, that are remote from school-based activities, may have some intrinsic worth. If the activities shown in *Figure 1* below above are taken as 'typical' activities then it is clear that only a relatively small number can be realistically mapped onto National Curriculum programmes of study, especially, 'fiddling about with the computer', being allowed to 'organise the computer's files and memory' or watching films and DVDs. It could be argued, in fact, that that these are not the sorts of skills that are learnt in the school. Witness (*see Figure 1*), for example, the range of typical activities children and young people use ICT at home for. Sutherland and Facer (2002), drawing specifically on the earlier *Screenplay Project* (2000) manage to identify a very wide series of activities. They (*ibid.*) also find, unsurprisingly, that games and writing are clearly activities which "are more prevalent than others" (*ibid.* p.8) but it is significant to note that "fiddling around on the computer" (*ibid.* p.8) formed a major portion of the overall ICT activity. It is hard to imagine this sort of activity (or this range, for that matter) being allowed in the majority of schools. Sutherland and Facer (2002, p.8)

found a wide range of activities being undertaken by young people in the home:

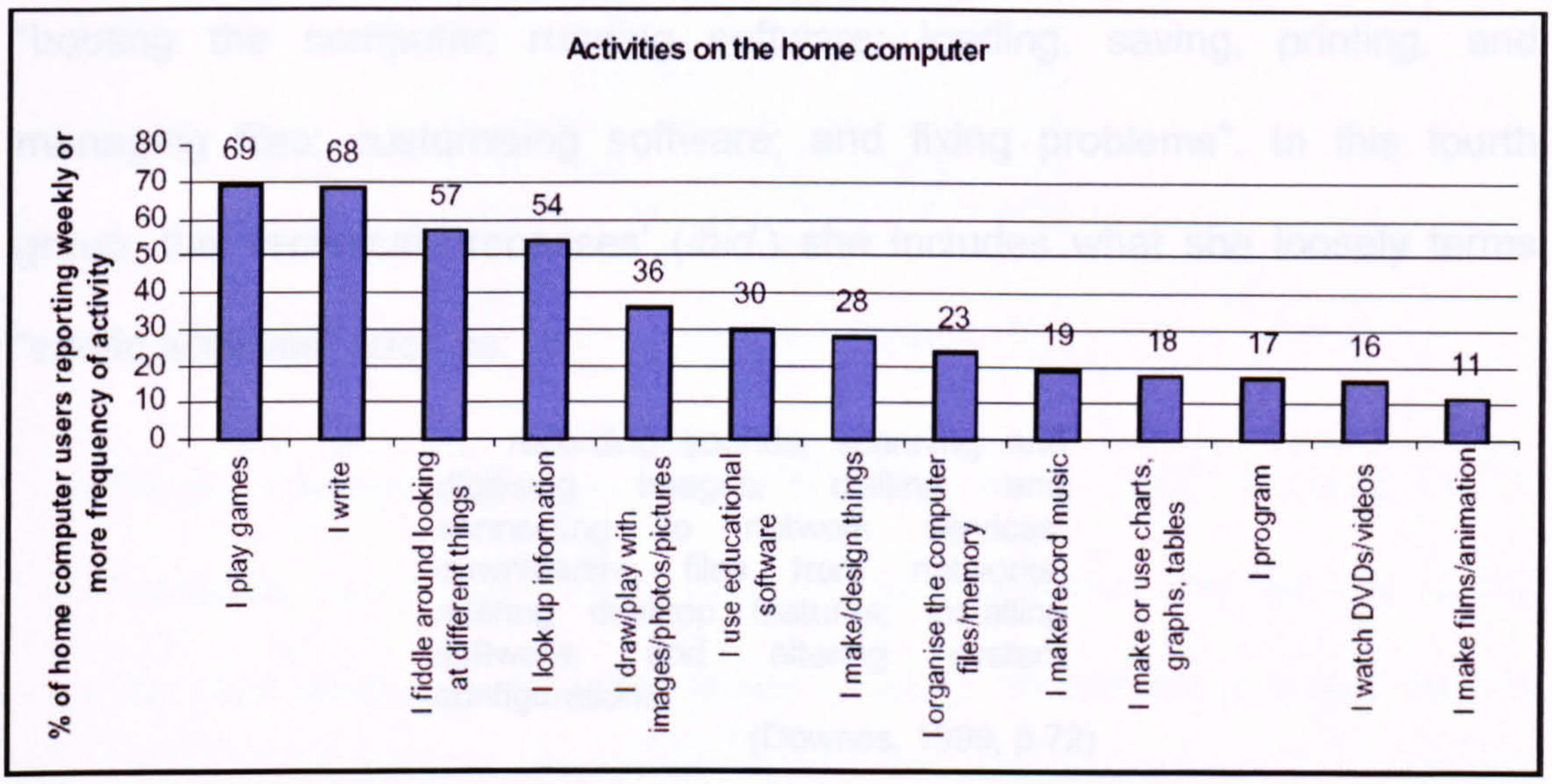


Fig. 1: from Bristol University's InterActive Project (Sutherland and Facer, 2002, p.8)

These activities and the underlying 'enabling' skills, however, are an essential part of learning the essential manipulative and conceptual skills, as argued elsewhere, that are necessary for full ICT capability. When ICT activities are framed from this perspective, all ICT activities can be seen as being, in one way or another, 'educational'. Much of the learning, arguably, that goes on in the home, may actually stem from this interest-based use and it is this that motivates children to experiment and engage with the technology.

There is the general recognition within the *Impact2* (2002biii, p.34) study, at least, that pupils, including the very young, have a "high level of technical skill with computers" (*ibid.*) and much of this and the "associated confidence with computers is derived from home" (*ibid.*). Downes (1999) also provided an insight into the range of skills children put to use on a day-to-day basis and distinguishes between games playing and other, non-games playing activities by dividing these into categories. She (*ibid.*) does not, for example, ignore the children's obvious technical skills when using ICT and sub-divides 'non game-

playing' (*ibid.*, p.72) computer activities into 'Creating texts', 'Using texts', 'Communicating' and a fourth group, the 'technical processes' such as: "booting the computer; running software; loading, saving, printing, and managing files; customising software; and fixing problems". In this fourth group, the 'technical processes' (*ibid.*) she includes what she loosely terms "exotic activities" such as:

> ... recording sounds; scanning and digitising images; dialling and connecting to network services; downloading files from networks; altering desktop features; installing software; and altering system configurations.
>
> (Downes, 1999, p.72)

Without these technical processes, learning with ICT becomes extremely difficult. The *Impact2* study (2002bi, p43) also points to this with its authors expressing surprise at the fact that children and young people are extremely adept at using computers and ICT:

> What was not anticipated was that for the most part pupils were familiar with handling computers and were not intimidated by the demands of the applications used.
>
> (*ibid.*)

Why this should be surprising is unclear, given that they suggest this could be partly due to "...the increasing numbers of computers in homes (ibid.).

There is also the suggestion, however, that this could also be due to the 'effectiveness' of the ICT curriculum. Whilst this could account for the phenomenon, that is, the fact that many children and young people are expert users of ICT, the effects of home-ownership are not to be understated. There is every likelihood then, as argued earlier, that home ownership and the use of computers in the home, is more responsible for these high skill levels amongst children and young people than computer use at school.

3.3 Playing to learn and learning to play

> Shocking as it may sound, in many ways a computer is a $3000 toy. It's a toy that adults and children can both use to find inspiration, stimulate the imagination, explore the world and meet other human beings...This process – as most, but unfortunately not all, adults will remember – is known as play.
>
> (Tapscott, 1998, p. 159)

The literature shows (e.g., Downes, 1999; Facer et. al., 2000; *Impact2*, 2002b i-iii; Kerawalla and Crook, 2002) that 'playful interaction' and 'fiddling about' with the technology, along with games playing, constitutes a major part of young people's ICT activities in the home. The playing of computer games would seem to encourage exploration and playful interaction with hardware and software simply because it is seen as 'play' and not 'work'. The findings from the *Impact2* (2002bii) study suggest that play forms an important component of ICT use at home with many of the skills learnt through playing games being transferable to other spheres of ICT usage (*ibid.*, p.12). The study also found that most young people will adopt what it calls 'exploratory' or 'trial and error' strategies which enable them to work out what hardware and software can do or "how to make it do what they want it to do". (*ibid.* p.34). This is echoed by Mumtaz (2002, p.159) when acknowledging the importance of exploratory play and ICT. Mumtaz (*ibid.*) points out that if children have a sophisticated notion of the function and role of ICT it is because of their use of technology outside school "through play, including web-surfing and the playing of games". This particular study (Mumtaz, 2001) found that children are experts at "playful exploration" and problem-solving skills. A significant number of children reported that they had gained

knowledge about the computer just by "playing about" with the equipment (*ibid.*, p.165). Similarly, Kerawalla and Crook (2002, p.753) comment that in their study of children's ICT use "children perceived more scope for exploration and 'fiddling about', compared to the rigid curriculum restraints' of the typical school environment. They continue (*ibid.*) that constitutes a serious gulf between parental aspirations for the creation of another "site for learning", and the reality that computers in the home mainly service games playing.

Downes (1998, 1999) also found exploratory 'play' and interaction to be a vital constituent of children's ICT-based activities. She writes that the major finding was that:

> children's activities, whether game playing, other leisure-related activities or work-related activities, involved 'playful interactions with the computer that led to exploratory approaches to learning about both the computer and the task itself.
>
> (Downes, 1999, p.65)

Downes (*ibid.* p.69) suggests that playing games is all about learning since all children manifestly "worked hard at learning to play new games and getting better at their games playing" (ibid., p68). Downes (1999) recognises the potential of games playing as a way of learning ICT skills and goes on to argue that these ICT environments "readily afford these approaches" and reinforce the predisposition towards "exploratory modes of learning" (*ibid.*, p.77). Downes (*ibid.*), in fact, goes as far as to warn of the dangers inherent in the increasing gap between how children learn and how schools expect them to learn. Selwyn and Gorard (2004, p. 51) identify a similar dichotomy between government 'institutional' expectations and how adults should learn and how

they actually learn, highlighting the dominance of the home as the key site of most adult use of ICT for learning and education.

There has been interest generated in the use of computer games for 'educational' purposes in an attempt at transplanting what goes on in the home into schools. McFarlane et al. (2003, p.5) admit that part of their research brief was to consider the "match and mismatch" between the skills and knowledge gained as a result of computer games playing and those skills and knowledge "recognised as valuable" within traditional school settings (*ibid.*). A similar pilot study, undertaken by the British Educational Communications and Technology Agency (BECTA, 2001) suggests that there are distinct advantages to the use of computer games in schools for 'educational' purposes and this is recognition that official bodies and agencies are at least exploring ways to tap into the potential of games playing.

There is little doubt, then, that children learn a substantial part of their technical repertoire of ICT skills through the playing of games. Modern computer games require a great deal of technical expertise and an in-depth knowledge of the more 'exotic' skills is a necessity for avid gamers. A brief read of a typical user manual will serve to illustrate the fact that a relatively advanced skills-base is required just to install and troubleshoot what usually is, after all, extremely advanced and complex software. Whilst most learning in the home takes place through play, not all exploration and playful interaction, however, occurs during games playing and may occur, for example, through manipulation of other ICT activities.

The ability to interact with other types of software is also learnt through this playful exploration. Evidence from India (Mitra and Rana, 2001), for

example, suggests that simply affording ICT inexperienced 'slum' (*sic*) children with the opportunity to experiment and play with computers and the internet was enough to catalyse and develop the learning of ICT skills.

Venkatesh et al. (2002) suggest that children will learn sophisticated and complicated technical operations in this fashion if, and when, a need arises; that is, they learn on a 'needs-to-know' basis, usually related to leisure pursuits *(ibid.* pp.6-7). Children, they argue, learn about software and hardware by playing around and "pushing buttons" and are able to incorporate ICT into their hobbies and interests by developing relevant computer expertise for specific purposes. Technological know-how, they (*ibid.*) continue, becomes very interest-led. They (*ibid.*) comment that:

> ...as a result of an interest or hobby, children are able to 'figure out' and therefore teach themselves complex operations, to further their areas of interest...computer education is based on intuitive learning and not on formal training. For these children, most explorations and learning are done in the unstructured environment of the home...
>
> (Venkatesh et al., 2002, p.8)

Similarly, Facer et al. (2001, p. 205) point out that it is the motivation for using the computer that actually shapes the way it is used and the skills that are learnt. The *Impact2* (2002bii) also highlights the role of personal interests and 'needs' as agents for shaping the way ICT equipment is used in the home. Interestingly, one of the criticisms levelled at this type of learning in the home is that learning tends to be 'deep' rather than broad: a lot is learnt about a narrow knowledge domain as opposed to the breadth of learning that supposedly goes on in school.

Downes (1998;1999;2002) goes as far as asserting that children's computer and general ICT skills are derived from the construction of the computer as a 'playable' environment. Downes (2001, p. 214) also makes the point that this analysis can also be extended to other activities, not necessarily games, in which children engage with computers and related technologies. There is also evidence from places such as Uzbekistan that games playing has a far more important role previously thought in that it helps to nurture computer-literate children and serves to develop familiarity with technology (Kolko et al. 2003)

3.4 In summary

There are differences, without a doubt, in the way ICT is used in a school environment and the way it is used in the home: one would, arguably, be hard pressed to find a school where children are allowed to play and experiment with ICT technologies without some sort of predetermined, planned 'educational' outcome. There is an obvious culture clash between children's and young people's perceptions of the technology and what schools and colleges expect them to do with it. Kerawalla and Crook (2002) provide an excellent account of the concept of 'domestic ecology' in contrast to that of the school and point to these differences. The informal atmosphere of the home facilitates the types of strategies identified by Downes (1998, 1999) and others such as, for example, Facer et al. (2000), the *Impact2* (DfES, 2002bii) study and Sefton-Green, (2004).

The Mitra and Rana (2001, pp.221-232) study also provides us with some insight into how children are able learn computer use in what may seem very difficult situations. As a starting point, at least, the study (Mitra and Rana,

2001) warrants particular mention because it helps us focus on the issues highlighted in the literature review. Essentially, they (*ibid.*) suggest that children manage to teach themselves (although it should be noted that 'themselves' does not necessarily imply 'on their own'). The observation that much of the learning of ICT skills arises as a result of playful exploration is often repeated and adds emphasis to the point that this sort of learning will only flourish in environments where 'freedom' and 'time' are not restricted. It is also evident in the literature review that most studies have framed learning in social contexts and find that it is rooted in social interactions.

Chapter 4: Towards a theoretical framework

Chapters 4 and 5 explain the theoretical grounding of the thesis and outline the basis of learning from the perspective provided by Activity Theory.

4.0 About theoretical perspectives

The theoretical framework serves to guide the data collection and inform the review of relevant supporting literature. A significant part of this research is, in fact, the search for an appropriate theoretical perspective from which to examine the acquisition of ICT skills in the home. Whilst these chapters obviously serve to provide the answer to one of the principal research questions: "*How do I find out?*", they also serve to demonstrate the applicability of the theoretical framework to the two other research questions:

"What is meant by claims that 'young people teach themselves ICT in their homes?" and "How do they learn?

Wellington (2000, p. 25) reminds us of the pitfalls awaiting those who neglect the articulation of a theoretical framework. It is useful, therefore, to remind ourselves that the word 'theory', (Wellington, 2000, p.27; Silverman, 2000, p.77) especially when used in the context of educational research, generally tends to mean a model or framework which helps us to understand events and to see them in a new or different light. The description of 'theory' as a metaphorical lens through which to look at the world under investigation, although well worn, is of use here. Silverman (2000, pp.76-78) reminds us of the importance of 'theory' and uses a kaleidoscope metaphor to illustrate the point that by shifting the theoretical perspective the world under investigation also changes shape. The research methods chosen, the literature chosen for the review, the researcher's intellectual allegiances, the theories subscribed to,

even the way it is written-up, all ultimately lend the research a particular focus. Since all research is ultimately subject to these perceptions and assumptions, no research can ever really be 'atheoretical'. The data collected, the phenomena observed and the conclusions arrived at in this thesis are informed, therefore, by the researcher's particular world-view.

4.1 A socio-cultural basis for a theoretical framework

This study is located within a socio-cultural framework where human activity – including learning and cognition - is seen as being socially-grounded. These can take place within groups of learners, between individual learners and even between the learner and the resource itself. Learning, from this perspective, is understood to take place between the individual and the social world. This thesis is premised on a conceptual framework that is co-constituted by a number of interrelated strands drawing from a socio-cultural base.

This approach sees learning and cognition as both culturally based and culturally influenced and as *social* rather than *individual* processes. The term 'cultural' refers to the socially structured ways in which societies organise themselves and their activities, as well as the kinds of artefacts that are provided to master those activities: they are the products of culture. The terms 'tools' and 'technologies' are used interchangeably with that of 'artefacts' for the purposes of this thesis. This standpoint provides us with an empowering theoretical framework that allows both the learner and the social world, the learner and the context, to take primacy as a unit of analysis. This cultural perspective, essentially, frames the notion of *activity* (intelligent action) as situated, socially based, distributed, mediated and participatory. Cultural psychology, with its subsumed corpus of Activity Theory, is part of this diverse

set of discourses developed as an attempt to formulate a theory of human nature and development that places culture at the centre (*vide*: Bruner, 1996; Cole, 1996; Crook, 2001; 2002). This perspective tends not to concentrate too much on explanations for learning and intelligent action based solely on the more biological, neurological or behaviourist approaches traditionally adopted by a more cognitively skewed psychology, in which learning is something that 'happens' to an individual. In biology, "culture" is the medium in which living organisms are 'cultivated' or grown. Similarly, cultural psychology perceives culture as a medium wherein human activity takes place and everyday interactions and activities are culturally mediated, therefore, by virtue of their occurring in this cultural medium. Learning and cognition are therefore seen as occurring within a specific socio-cultural context and seldom in isolation.

4.2 The reach of the 'social'

Crook (1994) reminds us that there are two senses in which the socio-cultural perspective insists that cognition and human activity are social in nature. First, it is claimed that all intelligent action is deeply grounded in a matrix of rituals, conventions, artefacts and practices: this framework is rooted in socio-cultural past or history. Even where an individual is alone and engaged in solitary cognitive pursuits, she will be relying on media and symbol systems that have a social nature. Second, cognition is social because the acquisition of new understandings is made possible through participation in certain kinds of supportive social interactions such as face-to-face *interpersonal* teaching or engagement in discourse.

At an *interpersonal* level of analysis, it is immediately evident that teaching and learning is a social process. Our schools and educational system, mass education, is based on the premise of social interaction. Teaching a class is itself an inherently social process. Children learning, whether in that same classroom or in their homes, are also engaged in social processes and interactions. The term *culture* is taken (Cole, 1996, 1998; Hollan et al., 2000) to mean the socially structured ways in which society organises and structures the types of tasks the learner faces, as well as the types of artefacts that are used to master those tasks. This serves to further reinforce this 'social' aspect of learning and human cognition.

Culture is itself a product of social processes, that is, culture emerges and develops from the activity of human (social) agency (Cole, 1996, 1998; Hollan et al., 2000). If culture is seen as 'social inheritance' then, by implication, participation in culture is also a social process: everything cultural is therefore social hence the use of the term 'socio-cultural'. Vygotsky (Vygotsky and Luria, 1994, p.138) viewed this socio-cultural behaviour as "a broader system of social ties and relations, collective forms of behaviour and social cooperation." Most popular pedagogies are 'social' in nature and ideas about learning have tended to move away somewhat from a total reliance on the 'individualism' of Piagetian theory which positions the learner as a 'lone scientist', acting upon the environment, observing and reflecting on results. This has given way to the recognition of the importance of the social 'construction' of knowledge.

The Vygotskian (Vygotsky, 1962) 'zone of proximal development' model, for example, where the role of a more able learner or teacher to 'scaffold' and

support the learner is emphasised, is also very much centred around the primacy of social activity. Lave and Wenger's (Lave and Wenger, 1991, pp. 48-49) concepts of 'situated learning' and 'participation' also pivot around what are essentially, interpersonal social interactions and activities, including a role for the 'zone of proximal development' that is inclusive of socio-cultural transformation as a function of the changing relations between people.

At another level, it becomes evident that the meaning of 'social' may be all too easily conflated with the notion of learning as, purely and solely, being based on interpersonal processes. Crook (2001, p.2 7) warns that cultural psychology's preoccupation with the social dimension of learning may actually be interpreted as an insistence on the *interpersonal* nature of learning. Crook (*ibid.*), referring to traditional teaching and learning, also notes that "synchronous, intimate, orchestrated, face-to-face interaction" is only part of a larger 'story' and makes the point that the reach of the term 'social' extends beyond this:

> For 'social' can be invoked to explain our experiences of learning and knowing even when there is no one else around, but when we are nevertheless educationally engaged. Even some of the most solitary of educational explorations can depend on grounding in social relationship and accountability."
>
> (Crook, 2001, p. 28)

If we adopt this particular socio-cultural view of cognition and learning, a lone individual, whilst perhaps being *physically* isolated, will never be *cognitively* isolated because of this inherent reliance on socio-cultural relations, norms, rules, mind-maps, schemas and the overall context of the learning or activity.

4.3 Communities of practice

Lave and Wenger (Lave and Wenger,1991; later further developed by Wenger, 1998) introduced the notion of 'Communities of Practice' and although it originally focused on an analysis of apprenticeship, the concept sheds light on other aspects of learning and cognition. They (Lave and Wenger, 1991) describe a community of practice as:

> ...a set of relations among persons, activity and world, over time and in relation with other tangential and overlapping communities of practice. A community of practice is an intrinsic condition for the existence of knowledge, not least because it provides the interpretive support necessary for making sense of its heritage.
>
> (Lave and Wenger, 1991, p.98)

Wenger (1998, pp.7-9) explains that communities of practice exist everywhere and we all belong to communities of practice constituted by families, friends, work, leisure pursuits and hobbies. In such communities 'newcomers' learn, over time, from 'old-timers' by being allowed to participate in certain tasks and activities relating to the practice of the community.

It is important to note that the notion of a 'community of practice' does not always necessarily imply a co-presence, an easily identifiable structure or a well-defined group but it does imply participation in an activity where participants have common understanding about what the activity is and what it means. The concept of 'community' has been described by Cole and Engström (1993, p.8) as constituting 'other people who must somehow be simultaneously with the subject as constituents of human activity' and it is this notion of community that is adopted for the purposes of this study.

4.4 Learning in context

Bruner (1996, p.4) explains:

> ...learning and thinking are always situated in a cultural setting and always dependent upon the utilisation of cultural resources. Even individual variation in the nature and use of mind can be attributed to the varied opportunities that different cultural settings provide...
>
> (Bruner,1996, p.4)

Knowledge is situated and is in part a product of the activity, context, and culture in which it is developed and used (Seeley-Brown, Collins and Duguid, 1989). A *situated cognition* perspective, views the social situation in which people live and act as an essential part of their knowledge, skills and understanding, that is, it is context-bound and everything is learnt in particular contexts. Lave and Wenger (1991) have suggested that what we learn is as much the context as the skills and processes that we use within that context. This perspective provides a powerful explanatory framework for common phenomena connected to learning and the problems arising from learning skills out of context. Lave and Wenger (1991, p.32-39) explain that on some occasions 'situated' is taken to mean that people's thoughts and actions are 'situated', or located in space and time. On other occasions, they *(ibid.)* explain, 'situated' is taken to mean that thought and action were immediately dependent on the social setting that occasioned them. This is sometimes used to explain observable phenomena such as the evident problems that sometimes arise with 'transfer of learning' whereby a child masters a spelling list in a spelling test but may not be able to spell these same words correctly when writing a story. This is because the learning of the spelling is inextricably bound to the context of the learning and there will

sometimes be difficulties when applying this outside the original context. Similarly, it serves to explain, for example, why people in certain occupations, such as plumbing or carpentry, are able to carry out complex mathematical or arithmetical calculations when perhaps these same individuals may have had problems mastering school mathematics.

Cultural psychology, as Kerawalla and Crook (2002, p.754) note, views learning as a 'situated' achievement with learners embedded in "systems of activity" comprised by "material artefacts, technologies, social relations, and institutional structures". What emerges, they write, is 'development' with respect to "the distributed nature of the learner's understandings." That is, learning entails "changes in regard to how intelligent action is 'distributed' across such cultural resources as documents, technologies, symbolic systems and the social structures of disciplinary communities" (*ibid.*). Cognition, in this way, depends on the learners' use of a variety of resources and cultural tools, these may even include other people. As Crook (2001, p.21) points out, learning is mediated by cultural tools in the way we:

> ...interact with the world through mobilising cultural resources into our actions: we act through these artefacts, technologies, symbol systems, environmental designs, rituals, and ways-with-words. These resources are the legacy of an evolving cultural history: we recruit them into our present actions. Thus any culturally influenced account of knowing and reasoning should take as its central concern the individual's appropriation and deployment of such resources.
>
> (Crook, 2001, p.21)

Cole (1996, p.102) regards this cultural view of cognition as being primarily concerned with the assumption that mind emerges in the "joint"

mediated activity of people. Mind, Cole (*ibid.*) argues, is thus 'co-constructed' and 'distributed' across these cultural resources and tools. Although Salomon (1993, p.111) warns against applying the concept of 'distributed' cognition too liberally, there is little doubt that intelligent action and activity are based on having recourse to distributed resources. Salomon (*ibid.* p. 114) gives the example of the individual thinking alone having only recourse to his or her own cognitive repertoire. Distribution of cognition, becomes impossible, he argues, because there the context does not offer opportunities for 'distribution'. The significance of this lies in the perception that concentrating purely on the social aspects of learning and cognition may tend to leave concerns about the individual by the wayside. It could be argued, however, that even the lone thinker cannot 'think' without having first accessed the products of a culturally distributed cognition (over time, space, people, texts and so on) and intelligent action. Whilst it may be true that the individual may not be in a position to share and distribute the fruits of thought, his or her imaginings and thoughts are themselves generated as a result of a 'prior' distribution of cultural and historical artefacts and schema. Part of the tension created by this perspective may be explained by an examination of Pea's thinking (Pea, 1993, p.51). Pea (*ibid.*) prefers using the term 'intelligence' instead of 'cognition'. The rational behind this, Pea (*ibid.*) explains, is that people and not objects 'do cognition' so, cognition per se, cannot be distributed across objects since it is a human attribute and function. 'Intelligence', according to Pea (*ibid.*), can be distributed over people and objects. The difference is subtle yet significant (for the purposes of this thesis, however, both terms will be used interchangeably

since they are adequately covered by the notion of 'activity' and such distinctions become irrelevant).

As Hollans et al (2000) point out, distributed cognition means much more than just cognitive processes being socially distributed across members of a group. They (*ibid.*) also point to the distributed nature of cognition being apparent in three main ways: cognititve processes may be distributed across the members of a social group, they may be distributed between internal (mental) and external (environmental) resources, and processes may be distributed through time in such a way that the products of earlier events may transform the nature of later events. This means that in order to understand cognition, Hollans et al. (*ibid.*), surmise, it is not enough to understand "how the mind processes information". It also becomes necessary to know how this information is arranged in the material and social world.

At the core of the notion of cognition as 'distributed' is that the learning process is part of an activity system that can configure itself, dynamically, to call on resources, whatever these may be, as, when and where needed, to accomplish the required goals. The environment people are embedded in, constitutes a pool of socially organised cultural resources and tools that have been accrued over time.

The importance of the context in which learning interactions occur is best brought to the fore when described using an ecological analogy. It is useful, thus, to think of the notion of ecology, applying the principles and concepts of ecology to the study of context and culture, in much the same way as a biologist may look at an ecosystem.

4.5 Ecology and Context

Learning takes place in socially structured and situated cultural settings. As in ecological models, in the biological sense, minor changes in ecological sub-systems may cause changes in other sub-systems and in turn, affect the whole. Each subsystem within the larger ecological system is interconnected, related and interlinked and modifications or changes at any level will have repercussions throughout the whole system.

Cole (1996;2003) develops this notion further by using a 'culture as garden' metaphor and in doing so emphasises the point that issues of context are very complex. Any model of context should not reduce it to matters of environment alone since context is much more than this:

> The second kind of definition views text and context as mutually constitutive. In the words of the Oxford English Dictionary, context is "the connected whole that gives coherence to its parts," a definition which has strong affinities to the Latin term, *contextere*, or to weave together. When used in this way, the ability to segment child and the context is problematic...
>
> (Cole, 2003, pp.1-2)

The learner, or the activity the learner is engaged in, cannot solely be seen as occurring *within* a context (or contexts) but should be seen as being mutually co-constitutive, that is, the action, actor and activity are actually part of the context.

At other times, however, it is useful to interpret context as "that which weaves together", emphasising the ways that all these ideologies, artefacts, institutions and individuals coordinate and co-constitute this particular pattern of ICT activity. Cole (1996, p. 135) argues that the boundaries between a task

and the context it occurs in are not clear cut and static but "ambiguous and dynamic". As a general rule, Cole (*ibid.*) postulates, that which is taken as 'object' and that which is taken as 'that which surrounds the object' are constituted by the very act of naming them: they are the same thing and the relationship is one of intrinsic reflexivity.

4.6 Cultural artefacts

Human beings mediate their interactions with each other and the world through culture. Cole (1998, p. 291) defines this " as human beings' social inheritance" embodied in artefacts. Artefacts are, in turn, defined as "aspects of the environment that have been transformed by their participation in the successful goal-directed activities of prior generations" (*ibid.*) They are generally conceived of as having value.

Vygotsky's (1978) concept of 'mediation' by cultural tools and resources is a core component of this theoretical stance and points to learning and cognition - human activity - being both *influenced* and *transformed* by the conceptual tools and resources (artefacts) that have emerged as part of a cultural history. The acquisition of a skill will depend on the medium used to acquire it. This 'transformative' function of artefacts may be illustrated by the example of a child learning an arithmetical computation. If a child learns to, say, multiply by visualising groups of items in her mind the activity becomes transformed by the use of pen and paper and different, in turn, when she uses an electronic calculator. These artefacts change the conceptualisation of multiplication as well as the actual situations where she can use it. The nature of the activity itself is changed by the use of these different artefactual means. Most importantly, artefacts are also social entities. They are developed and

redeveloped as a result of social and cultural transformations that occur in the environment in which the activity is carried out.

Artefacts are seen as what 'constitutes' culture and they could be material and tangible, such as tools, or symbolic, such as language. Wartofsky (Wartofsky, 1973, cited in Cole, 1996, p. 121) provides a useful 'taxonomy' of artefacts by categorising these into primary, secondary and tertiary artefacts. Primary artefacts are tools used *directly* in production, for example, a hammer, a computer or software. Cole (1996, p. 121) notes that primary artefacts include the spoken word, writing implements, instruments and even telecommunications networks or mythical historical personages.

Secondary artefacts are those means by which we preserve and transmit the skills in the production and use of the primary artefacts such as representations of ideas (the ideas themselves are another thing), instructions, recipes, traditional beliefs, norms, rules and regulations and so on. Secondary artefacts also constitute "modes of action using primary artefacts" (Cole, *ibid.*). The tertiary artefact, in this taxonomy, is concerned with the mental representations of the primary artefact, for example the social status that a person or thing is given. Tertiary artefacts, such as mathematics, physics, sociology, languages themselves, provide the schemas to create and manipulate secondary artefacts. It is interesting to note that, as Wartofsky (1979) points out, tertiary artefacts act upon themselves in as much as languages and say, mathematics, are self-referential. In this way, tertiary artefacts may be used to construct, in the imagination, that which might be, but which does not yet exist. Wartofsky (in Cole, *ibid.*) links the notion of tertiary artefacts to the arts, processes of

perception and the imaginative world. Cole (*ibid.*, p.122.) generalises this conception to 'notions of schemas and scripts' and 'context, mediation, and activity' (*ibid.*). Cole (*ibid.,* p.120) also notes that tertiary artefacts serve to colour the way we see the world. Adults, for example, use these cultural models (schemas) to reason about objects, social institutions and, say, general properties about humans. Such schemas are used to interpret both the physical world of objects and events and the more abstract world of social interaction, discourse, and language usage.

It is interesting to note that the concept of schemas and scripts lies at the heart of the *Impact2* (DfES, 2002) study and its use of 'concept mapping' to elicit children's representations, schemas and cultural models of ICT and technology. Secondary artefacts, significantly, can constitute a physical manifestation of tertiary artefacts. The artist's imagined world (a tertiary artefact) is conveyed as a painting or sculpture (a secondary artefact) produced, in turn, through the mediation of tools (primary artefacts such as the sculptor's medium mallet or blowtorch, chisel or the painter's brushes, paints and palette). In much the same way, the concept-maps of primary school children (*Impact2*, DfES, 2002) were produced through the mediation of primary artefacts such as pens, pencils and paper. The products were physical concept maps on paper (secondary artefacts) representing children's imagined worlds and perceptions of the function and possibilities of ICT (tertiary artefacts). Although Pearson and Somekh (2000, p.4) describe these representations as 'secondary' artefacts (the boundary between secondary and tertiary artefacts can be somewhat tenuous), in children's minds, they constitute tertiary artefacts (cultural models and schemas).

4.7 Affordances

The term 'affordances' comes from the study of the psychology of perception (Gibson, 1979) where the metaphor of 'ecology' is extended into a whole field of study called 'ecological physics' (*ibid.*) and 'ecological psychology' which takes human and environmental interactions as a focus of interest. This ecological approach concentrates on everyday perception and action within the environment. This approach views 'affordances' as the fundamental objects of perception and is based on the premise that people perceive the environment in terms of its potential for action and activity. Pea (1993, pp.51-54) argues that successful learning will always depend on the success of the 'social constructability of affordances' (teaching and learning) and summarises the notion of affordances by pointing out that knowledge is 'carried' or reified in an artefact and this knowledge may come to be exploited in activity by a learner through a variety of paths: through observation of use by others, through playful discovery of affordances or through guided participation in its use.

Essentially, 'affordances' can be described as the properties of the environment or of an artefact that are *perceived* to be compatible with, and relevant to, people's actions and activities. The concept is extremely powerful for thinking about tools and artefacts because it focuses on the interface between the user and the artefact or tool.

An ecological approach to social behaviour is obviously useful for assisting in the design of artefacts and tools meant to support interaction such as an office layout, for example. It also provides insight into social behaviour via the notion of 'social affordances' (Gaver, 1996, p1). In much the same way

as the affordances of a tool or artefact dictate how it will be utilised, "social affordances" focus on the potential that people offer one another and on the role of other people in pointing out new affordances (e.g., parent to child or peer to peer interaction). In other words, the concept of affordances also covers the possibilities and potential offered by the environment for social interaction: individual people and social communities may also have affordances as attributes.

The social aspects of learning, culture and cultural artefacts, distributed and situated cognition, affordances of tools and artefacts, ecological approaches, context and the role of the community, we have seen, are all significant concepts when looking at learning from a socio-cultural perspective and will be seen to be of relevance when examining human activity.

Chapter 5: Cultural Historical Activity Theory

Chapter 5 continues mapping out the theoretical framework of this thesis and discusses the implications of Cultural Historical Activity Theory or Activity Theory as it is referred to in the thesis.

5.0 Activity Theory

Kaptelinin (1996, p.107) notes that Activity Theory can be characterised as an attempt to integrate learning, culture and cultural artefacts, distributed and situated cognition, affordances, tools and artefacts, ecological approaches, context and the role of the community but especially the 'objective', 'the ecological' and the 'socio-cultural'. The principle of 'objectiveness', Kaptelinin (*ibid.* p.108) points out, is of fundamental importance to Activity Theory in which the social and cultural properties of the environment exist regardless of our feelings about them. Human beings exist in an environment consisting of entities with 'objective' features. This principle of 'object-orientedness' states that we live in a reality that is objective in the broadest sense: the social and cultural properties of environment are as objective as physical, chemical or biological ones. An object in an activity can thus be a physical tool, an idea, a concept, an objective (as in an aim) and so on: 'driving a car', using a hammer, obtaining food and saving a file in a computer, may all be therefore be construed as objects.

An Activity Theory perspective affords us a prism through which all the co-constituting, socio-cultural strands can converge. Activity Theory has been primarily used to analyse work-based learning (see Engeström et al, 1999) or learning in school- or college-based situations (e.g., Romeo and Walker,

2002; Lim, 2002; Bottino et al., 1999; Barab et al., 1999). It has not been used to examine the learning of ICT skills in domestic contexts.

Perhaps the first observation to be made is that it is not, in itself, a theory as in a means of providing explanatory or predictive capabilities. Activity Theory (for the purposes of this thesis 'Activity Theory' is used interchangeably and synonymously with Cultural Historical Activity Theory) is perhaps better regarded as a related set of concepts, ideas and terms, drawn from a socio-cultural corpus, that are useful in describing phenomena associated with human endeavour. The principal feature of Activity Theory is that it provides us with a rich, descriptive language and a set of conceptual tools to help with the understanding of the relationships between cognition, community, context, activity and all the other factors that co-constitute human endeavour. It is a theoretical vantage point that allows us to look for answers from different directions and with varying levels of magnification. Essentially, any time a person or group interacts with tools and artefacts over time to transform some object, with some shared motive to achieve some outcome, we can analyse their interactions as an Activity System.

Russell (2002, pp. 64-65) reminds us that Activity Theory forces us to look beyond the theories of learning that at first seem 'obvious' to teachers and educators looking at a learner facing, say, a computer screen, 'learning' whatever appears on the screen. Activity Theory looks beyond the individual learner and the 'content' of what is being learnt to understand the social and material relations that affect human learning as mediated by tools and artefacts. Learning, from this perspective, is not seen as merely the internalisation of information by the learner (although undoubtedly,

internalisation plays a very significant role in the learning process) but as the expanding social and intellectual involvement in 'activity' over time.

Activity Theory takes an object-oriented activity system as the prime unit of analysis allowing the observation of the actual learning process in context, where the context is actually the activity system itself. The basic structure of human cognition that results from tool and artefact mediation has traditionally been represented as a triangle (*Fig. 3*), itself a development of earlier stimulus-response (*Figure 2*) of a 'subject- acting-upon-an- object' model of cognition:

Fig. 2: Simple stimulus-response model

A young child picking up a morsel of food and eating it because it is hungry could be thought of as a simple example of 'unmediated' action. It is difficult, however, under normal circumstances, to regard 'intelligent' action as being totally unmediated by cultural, historical artefacts and psychological tools. A recognition of the existence of cultural artefacts from the world around the subject having an influence on the simple stimulus-response path, the products of historical development, has to be added to provide a better, more accurate representation of the more complex interaction between stimulus, artefacts and response. The psychological tools used in this example, for instance, would be the cultural knowledge that allows the child to decide whether or not the food in question is edible and safe (unless, of course, the child is young, not yet 'encultured' and not able to draw upon this knowledge).

An activity, in its most essential, basic representation, is composed of a subject (the child, in this case) and object (food, in this case) and the mediating artefacts ('enculturation' in this case). The object is the 'raw material' or the 'problem' space at which activity is directed in order to transform it into a projected outcome. This is important: the transformation of an object into an outcome will always involve a projection of the object into a future state. The object motivates the subject into action, in turn mediated by all or any of a series of artefacts. These mediating factors can occur through the use of many different types of material tools and machines, psychological tools, culture, ways of thinking, language, laws, rules and so on which constitute the basic constraints on individual human cognition.

An activity is motivated by the need to transform the object (the raw material) that will be transformed into an outcome or a result. The outcome can be a material or a totally intangible thing, such as an idea. The object and the motive can change during an activity because the relationship between the subject and the object of activity is dynamic and itself changes as it is mediated by a cultural artefact. The artefact will also have the 'history' of this developing relationship and can be either a material object or a tool for thinking. This is the system represented by the 'triangle' in figure 3:

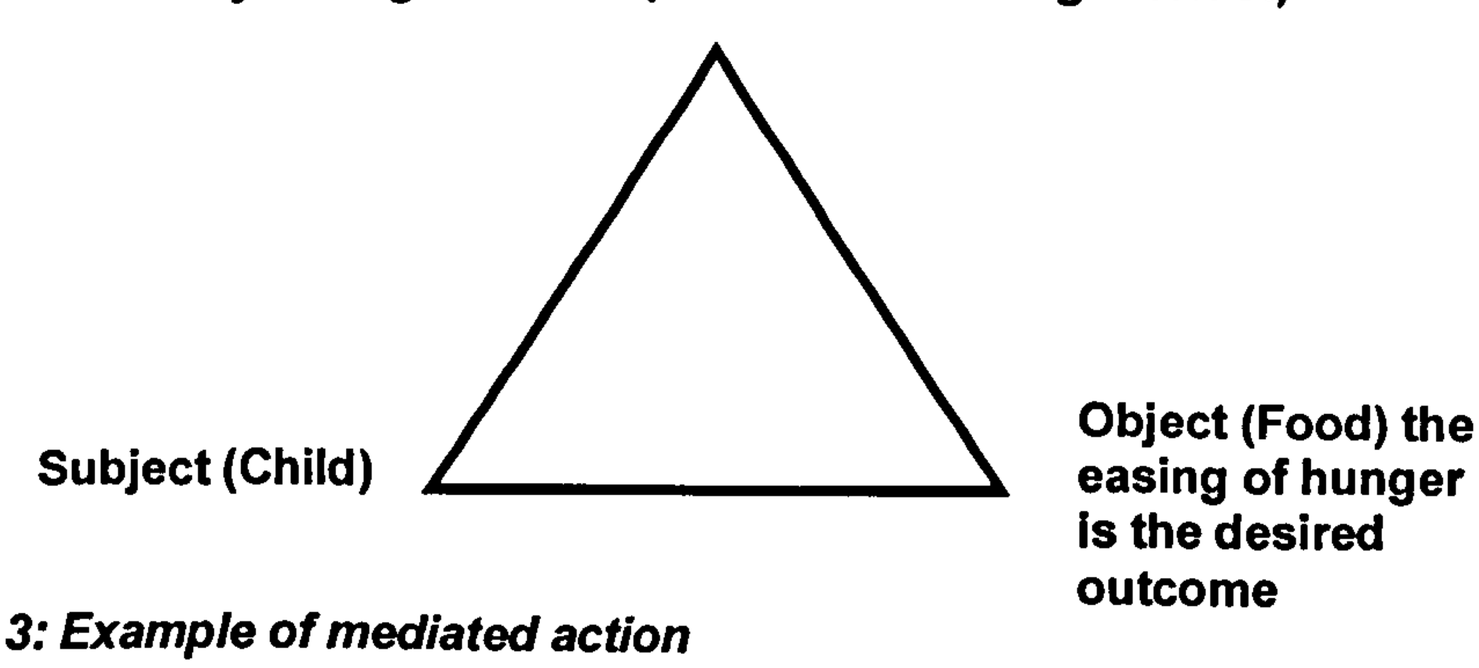


Fig. 3: Example of mediated action

As Kuutti (1995) points out, the mediating tool or artefact is, at the same time, both enabling and limiting since it empowers the subject in the transformation process with the historically collected experience 'crystallised' in it, but it also restricts and constrains the interaction to the particular perspective associated with the use of that tool or artefact. Other potential features of the object will probably remain 'invisible' to the subject.

Cole and Engeström (1993, p.5) explain that 'natural' or unmediated functions are those occurring along the base of the 'triangle' whilst 'cultural' or mediated functions are those occurring along the vertex of the 'triangle. It should be noted that there is no intention to represent functions in a one sided way, that is, mediated or unmediated. The 'natural' is not replaced by the 'cultural' route but will exist simultaneously within any activity system, that is, both the mediated and unmediated, the directly 'given' and the culturally mediated. Cole and Engeström (*ibid.*) explain that such a conclusion is necessary because human beings do not cease being 'phylogenetically evolved creatures' simply because we are capable of creating, transmitting and acquiring culture.

The concept of 'time' and 'history' is important to Activity Theory (Cole and Engeström, 1993; Cole, 1996). Cole and Engeström (1993, p.21) explain that human beings generally assume that the cultural future will be more or less like the cultural past. We can thus only project a future based on past, culturally mediated experiences. The different ways in which this 'temporality' serves both as a major constraint and at the same time, a valuable cognitive resource for human development is illustrated in figure 4.

Cole and Engeström (*ibid.*, p.20) focus on several different 'time-lines' that affect human activity. There is 'physical time', or the history of the universe that precedes life on earth; 'phylogenetic time', the history of life on earth; 'cultural-historical time' which Cole and Engeström (1993, pp.18-22) argue "has co-evolved with phylogenetic time" and represents the history of human beings on earth; "ontogeny", the history of the human beings involved in the activity or that of a single human being, and finally, 'microgenetic time', the "moment-to-moment time of lived human experience" (*ibid.*, p.19). Cole (1996, p. 185) discusses the concept of historicity using the birth of a child as an example to show how adults cannot help but interpret the activity in terms of their own culturally mediated experiences.

Figure 4 shows these same concepts applied to a more apropos activity as could be the buying of a computer for a child. The vertical ellipse represents the event or activity of buying a child a computer as a present. The effect of time and history is represented by 1, the parents' memories of the past and 2, the parents' projection of the child's future and 3, the parents' subsequent behaviour.

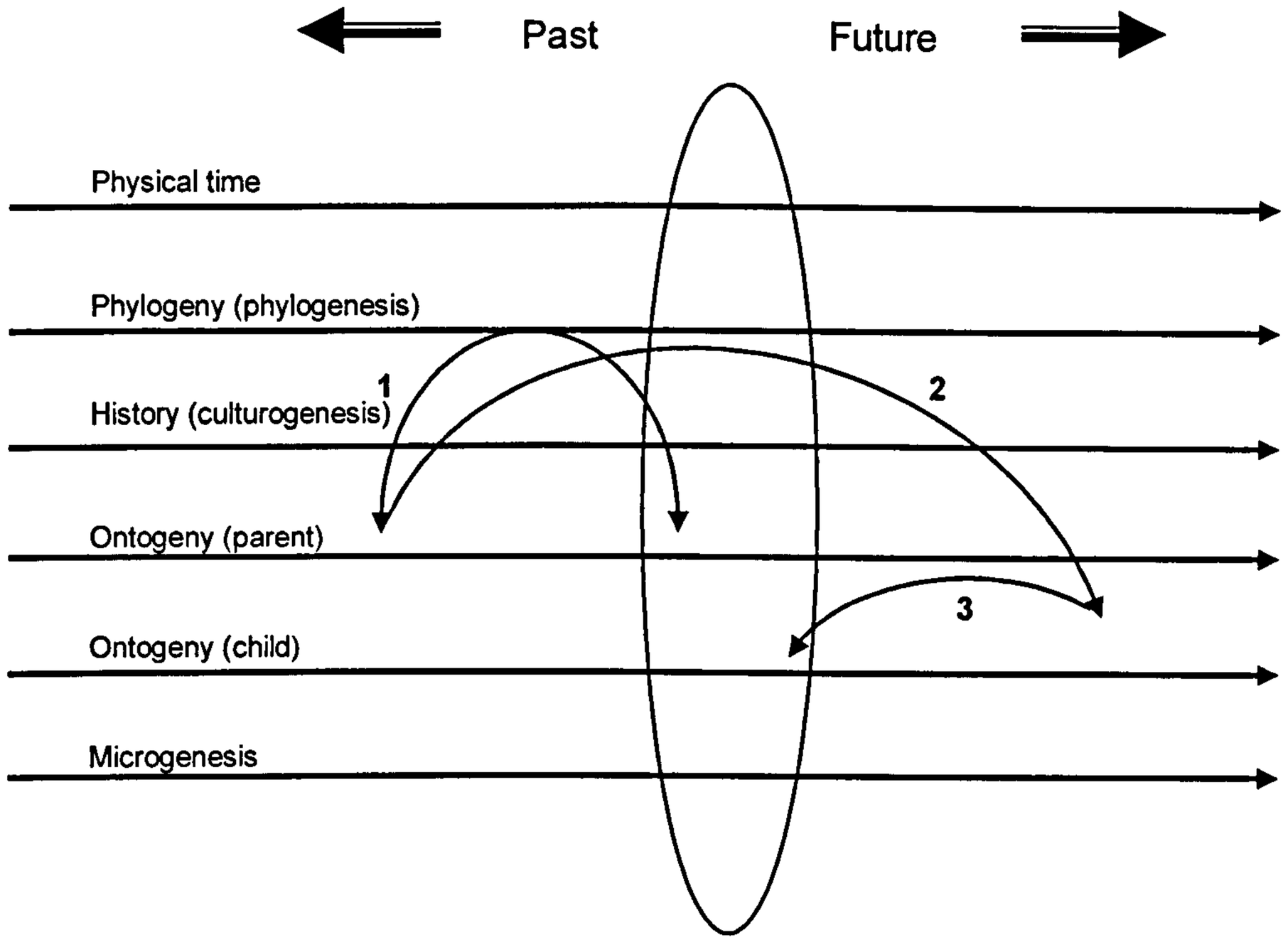


Figure 4: Looking backward, looking forward, after Cole, 1996, p.185

The 'ideal' aspect of culture is thus transformed into a material form because, in this example, "adults structure the child's experiences to be consistent with what they imagine to be the child's future identity" (Cole, 1996, p.185). When the story is told, the 'event' would read as follows: parents decide to buy their child a computer because they wish their progeny to be ICT literate and wish to afford their children every opportunity to start their educational career on the best possible footing. They also wish their parents could have afforded them these opportunities and so on. The arrows, therefore, represent **1**, the parents' remembered cultural past (without a computer and the opportunities it affords). **2**, the imagined cultural future of the child (made better by the acquisition of a computer) and **3**, the actual, day-to-day lived experience of purchasing and giving. Figure 4 shows, graphically, how human activity and cognition depends on a constant 'flitting', back and forth, of consciousness:

> Human nature is social in a sense that
> is different from the sociability of other

> species because only a culture-using human being can "reach into" the cultural past, project it into the future, and then "carry" that (purely conceptual) future "back" into the present in the shape of beliefs that then constrain and organise the present sociocultural environment of the newcomer.
>
> (Cole and Engeström, 1993, p.21)

Engeström (1987) also introduced the notion of the 'community' into the model of activity shown in figure 5 and this leads to two new relationships: that between the subject and the community and that between the community and the object. The Activity model becomes a triangle with six 'nodes' as illustrated in figure 5:

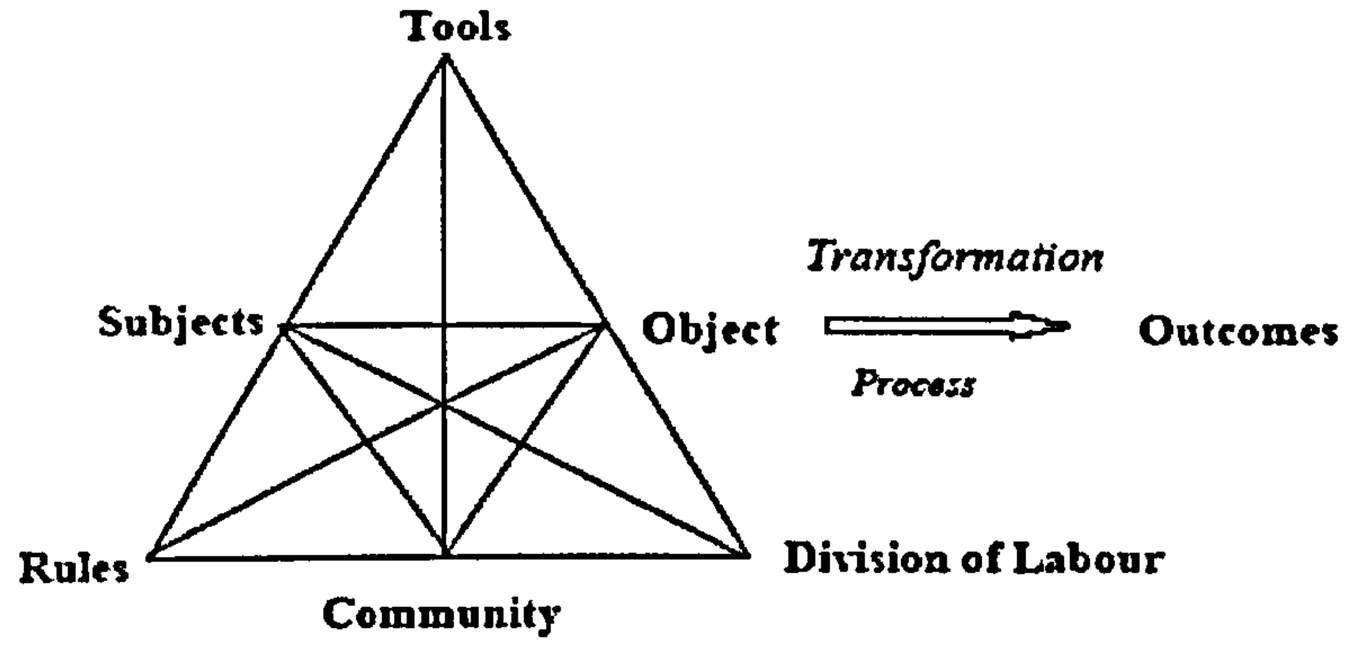


Fig. 5: The basic mediational triangle expanded (after Engeström, 1987) to include other people (community), social rules and the division of labour between the subject and others.

The relationship between subject and object is mediated by cultural artefacts, while the relationship between subject and community is itself mediated by rules and the community's collection of mediating cultural artefacts. The relationship between object and community is, in turn, mediated by the division of labour. The artefact may be anything used in the transformation process while the rules are the "norms and sanctions that specify and regulate the expected correct procedures and acceptable interactions" (Cole and Engeström, 1993, p.7). Rules may be explicit or implicit norms, conventions

and social relations within a community. The division of labour is the continuous, negotiated distribution of tasks, powers and responsibilities among the participants of the activity system in relation to the transformation process of the object into the outcome. It is important to note that activities are not isolated units, but nodes in criss-crossing relational networks which in turn are influenced by other activities (hence the term Activity *Systems*).

Kuutti (1996, p.30) gives the example of a software programming a system for a client and shows that what may seem to be one main activity is in reality an intricate network of related activities. Real-life situations always involve an "intertwined and connected web of activities that can be distinguished according to their objects" (*ibid.*) This model (Figure 5) contains three mutual relationships between the subject, object and community although all elements within the model will have a bearing on the other elements. Activity Theory, then, draws these together. The Activity System triangle can be thought of as the 'standard' lens of Activity Theory and it can be used to 'zoom in' on the different actions, goal-directed processes and components of the system whilst still keeping the overall, 'whole' activity in focus.

5.1 Activity, actions and operations

Kuutti (1996, pp.17-44) points out that to become more skilled in something, that is, to properly learn something, the learner has to eventually transform conscious 'actions' into unconscious 'operations'. Kuutti (*ibid.*) illustrates this by using learning to drive a car by way of example. At the beginning of the process, the learner uses conscious actions that require careful planning, sequencing, decision making and conscious effort. Eventually, these actions

begin to transform from 'actions' into 'operations' by fading from consciousness and becoming automatic.

It is clear from this that the boundary between activity – action – operation may at times be blurred and indistinct. An activity may quite easily become an action once it loses its motive and action may become an operation once the goal changes. Building a computer from scratch, for example, may well be considered an activity with a soldering-iron being used at a level of operations because it is used automatically and without conscious deliberation. The utilisation of this implement, whilst its correct usage was being learnt, may have once been an activity with a specific motive, that is, to learn the use of a soldering-iron. It could also, of course, be considered to be an action with the specific goal, say, of fixing a loose wire onto a circuit board within the overall activity system whose object is to build one's own computer. It is impossible, as Kuutti (*ibid.*) notes, to make a general classification as to what an activity is, what an action is and so on. The definition will be entirely dependent on what the subject and object are in any particular situation. The double-headed arrows highlight the point that at any instance in time, an action could be an activity or an operation could be considered an action and so on. An example of the different stages is provided in Figure 6 below where an exemplar activity system is broken down into its component hierarchical levels:

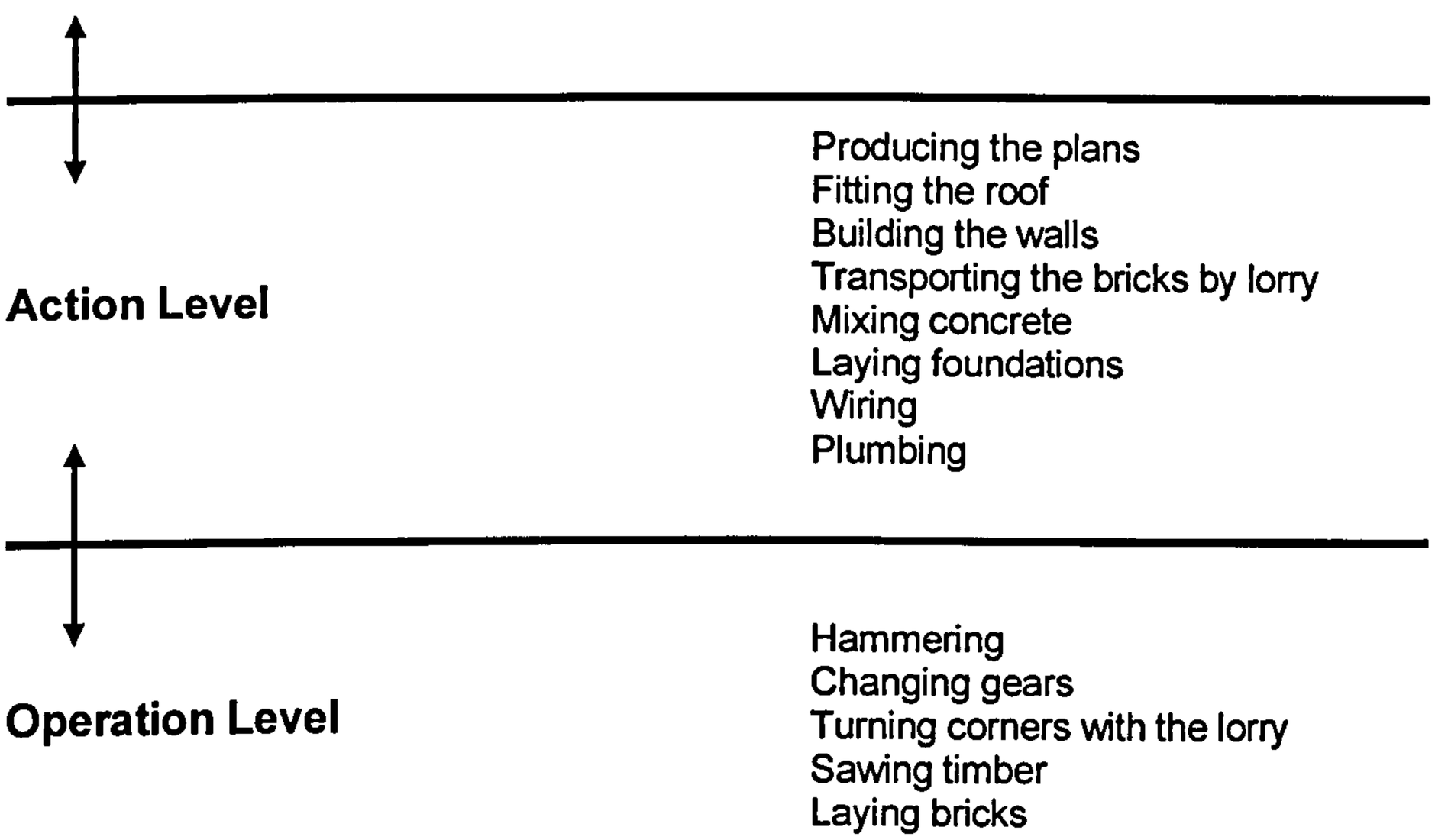


Fig. 6: Examples of activities, actions and operations (after Kuutti, 1996)

5.2 Contradictions, conflicts and dissonances

Essential features of Activity Theory are contradictions and conflicts; these manifest themselves as 'breakdowns' or imbalances between the components of the activity system, they are central to the theory and arise where there are changes to the nature of the activity. For example, a contradiction could occur when a new tool or artefact is introduced into a community, which does not have any rules of practice to make effective use of that tool (a good example of this is the 'contradiction' caused by the introduction of ICT and related technologies into schools) .

Activity Systems are almost always in a state of flux as they are almost always in the process of working through some contradiction or other. Contradictions may manifest themselves as problems and are a source of development and learning. Contradictions may occur either between or within activity systems or between related activities or systems. Activity Systems,

Russell (2002, citing Engeström, 1987) reminds us, are constantly working through contradictions within and between their elements. Significantly, Activity Theory sees contradictions as sources of development and learning since the working out of these contradictions and dissonances drives change.

Engeström (1987) identifies four different types of contradictions or 'breakdowns'. Those found within a single component of an activity are described as 'primary' contradictions and those occurring between the different components of the Activity Triangle themselves are described as 'secondary' contradictions. Primary contradictions may arise as a result of conflicting perceptions, say, about the nature of the artefact or object of the activity or dissonances within the community of practice, contradicting rules and norms and so on. In practice, primary contradictions will arise as a result of the actions and sets of actions used in the realisation of the activity. Secondary contradictions may arise as a result of conflicts between the artefact and the object. Contradictions arising between an existing Activity System and more culturally advanced Activity systems that evolve from the original activity or activities, are known as 'tertiary' contradictions. These are usually the result of a remodelling of existing activity to take into account newer ways of working or participation in the activity. As the contradictions and breakdowns of an activity system become aggravated, participants begin to question and deviate from its established rules and norms. Eventually, the activity system will be transformed and reconceptualised.

Contradictions arising between concurrent Activity Systems are known as 'quaternary' contradictions. Contradictions will always arise, inevitably, in Activity Systems and they are an intrinsic part of human activity. They may be

seen as disturbances in the free-running of an activity and it is in this light where they will be found to be of most relevance.

The research questions can be comfortably located within the theoretical framework described in Chapters 4 and 5 given the socio-cultural nature of the concerns they address.

Chapters 4 and 5 go some way towards providing an appropriate answer to the third research question: "How do we find out?" The 'answers' outlined in these two chapters also provide a lens through which to examine other 'answers' that arise, quite naturally, as a result of the initial inquiry.

Chapter 6: Methodological considerations

6.0 Introduction

> A method turns out not to be a spanner – or even a micrometer – but rather something which has to be painstakingly custom-built from other drafter's cast-offs which, whilst providing a general guideline, were not made *for this particular job.* It is actually this particularity which it becomes the task of methodology to explain.
>
> (Clough and Nutbrown, 2002, p.27, italics in original)

As Clough and Nutbrown (*ibid*) point out, research 'methods' cannot be thought of simply as "end tools" which the researcher takes "off the shelf" as the need arises. Instead, these must be crafted to suit specific purposes given that all research studies are inherently different.

Particular research methods generate particular forms of information and these tend to reflect the particular stance and world-view taken by the researcher. This research study utilises methods that are in consonance with a Cultural Historical Activity Theoretical perspective. because of their capability of generating data of a type that can be used to provide accounts of cultural phenomena. Initially, a framework based on Cultural Historical Activity Theory is used to organise and make sense of these accounts. The data analysis stage involves the summarising, in diagrammatical form, of the activity systems depicting ICT use and learning along with an explanation and discussion of contextual considerations and factors involving the use of ICT in the home.

6.1 Using Cultural Historical Activity Theory

A socio-cultural perspective rejects the view that learning can be viewed in isolation from the broader context in which it is situated. It will be clear, as Lim (2002, p.413) notes, that cognition is not studied in the light of individuals learning in isolation with "only their minds to guide them" but, instead, the emphasis has shifted (when seen from an Activity Theory perspective) to individuals, and groups of individuals, learning with a wide variety of tools, artefacts and other people.

An Activity Theory perspective forces any analysis we undertake to focus on the *whole learning environment* and not on any one single facet. The broader context, as Cole (1996) has argued, may be taken account of by applying a 'garden-as-culture' metaphor (*ibid.*, pp.143-144). 'Culture' and 'garden' are notions sharing the same basic idea of the 'micro-world' of the individual plant or learner and the 'macro-world' of the external environment. The gardener thus has to tend to the plant but also pay heed to the vagaries of the external variables of the environment. Cole (*ibid.*) argues that the 'garden-as-culture' metaphor reminds us that there must be a concern with the systems of interactions within particular settings and the way the internal system is related to the next level of the contextual envelope. Cole (*ibid.*) continues the metaphorical exercise with the observation that the researcher, like the gardener, must attend to what occurs inside the system and what transpires around it. These two concerns are interdependent given that the activity system is embedded within a larger ecological system.

The ideas presented in Activity Theory, then, seem extremely promising in that they provide an analytical framework and a descriptive vocabulary that

can be used to describe human activity. There is, however, no commonly established or agreed method for using Activity Theory to guide research. There have been, however, a large number of instances where it has been used in the field of Human Computer Interaction (HCI) and systems design to explore activity systems within workplace contexts as diverse as Primary Healthcare Centres in Finland (Engeström, 2001), the Danish police 'Flying Squad' (Christiansen, 1996) or the US postal service (Engeström and Escalante, 1996). There is no standardised or 'preferred' mode in which Activity Theory is to be used as a research methodology. Although both Engeström (1993) and Kaptelinin (1996) make extremely useful recommendations, they do not offer ready-made research procedures.

Engeström (1993) suggests that the researcher keep three principles in mind: that the researcher should concentrate on a collective activity system as the principal unit of analysis, that the analysis of contradictions, dissonances and conflicts should not be ignored and, thirdly, that attention has to be afforded to the historical development of the activity under analysis from within the context in which the activity is normally carried out. Kaptelinin (1996, p.110), in turn, asks questions that focus attention onto issues such as which tools are available to the user other than ICT based ones? Does computer use correspond to the level of 'actions' or to the level of 'operations'? What are the structures of the social interactions surrounding computer use? What are the objectives of computer use by the user? How is this use related to the objectives of other people and the group or community as a whole? Nardi (1996, p. 243) argues that these are precisely the sorts of questions that we should ask when analysing data about computer and ICT use and offers "a

veritable cookbook of questions" that will help in the structure of data collection and analysis. There is a need for this sort of structural approach because human activity is rarely simple and it is affected by such a diverse and rich series of contextual layers (Bronfenbrenner, 1979; Cole, 1996) that it will be difficult, if not impossible, to decide what to actually look for unless there is a specific level of analysis to act as some sort of constraint. Essentially, then, it is the triadic representation of activity represented by the 'triangle', main lines of influence and nodes proposed by Engeström (Engeström,1987;1999) that is going to provide the researcher with a useful structure for 'operationalising' Activity Theory. This representation allows us to describe activity in some detail, especially when using the **subject-object-artefact** triad as basic reference points from which to look at the entities that mediate these relationships (rules, community, division of labour and so on). Such an approach has been used to examine school-based activity and the integration of ICT into school life (e.g., Romeo and Walker; 2002; Lim and Hang, 2003) but there are no instances in the literature (up to the time of writing) of similar strategies being used to examine the learning of ICT in the home.

Activity Theory, hitherto, has been used to *inform* data collection and help *structure* the analysis and the organisation of this data after collection. In reality, Activity Theory has been used more as an analytical device and "a theoretical tool for thinking" (Christiansen, 1996, p.177) than as a 'methodology' *per se*.

The production of this thesis (see figure 7) itself, for example, can be modelled in terms of an activity system and the diagram below illustrates how

Activity Theory is able to provide us with a framework, a vocabulary and a suitable structure to aid the data analysis:

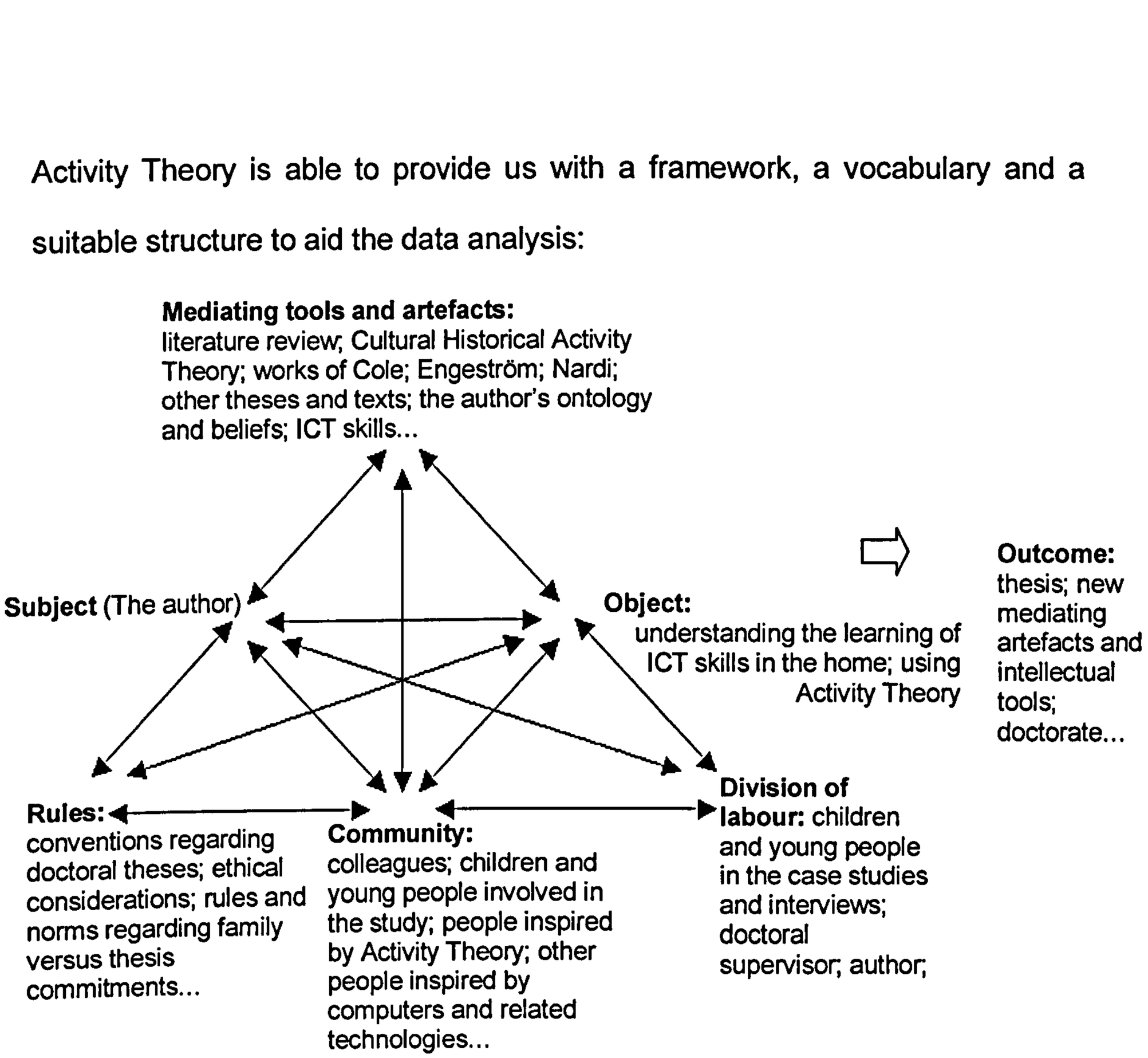


Fig. 7: This thesis modelled as an activity system: the data analysis stage

Figure 7 provides an illustration of the general format of the 'modelling' of an activity system, in this example the activity system is this thesis itself.

For it to be fully understood, the model has to take the different contextual layers into account as they affect the production of the thesis and this can only be included in the inclusion of an account, 'rich description' of the content or some sort of diagrammatical illustration. This particular activity system has to be viewed from the perspective of the different 'ecological levels' (Bronfenbrenner, 1979, Cole, 1996; Lim, 2002). In other words, the triangular model used to depict the activity, at a micro-system level, does not reflect the full extent of all the cultural and social influences impinging on the activity system and does not suffice, on its own, as a 'complete' representation. If we

are to fully understand an activity system, a description of contextual considerations will have to be included in our depiction of activity. Given the scope of this thesis, the different contextual layers have been taken into account and discussed where relevant although the activities have been largely examined at a micro-system level. The triangular model *along* with the notion of this 'ecology' of activity systems, provides us with useful pointers as to how to model 'activity' more faithfully. Using this thesis as an example, the table below shows how Bronfenbrenner's (Bronfenbrenner, 1979) concept of 'ecology' can be applied to activity systems:

ECOLOGICAL LEVELS	EXAMPLES SEEN FROM AN ACTIVITY THEORY PERSPECTIVE
Microsystem (main concern of this thesis)	A series of smaller activity systems contributing towards the overall, larger activity system: the production of the thesis; other activity systems involving the different activities related to the thesis such as reading, writing, thinking and so on.
Mesosystem	The relationships, links, dissonances and contradictions between these smaller, constituent activity systems
Exosystem	The community of practice to which the subject of an activity system belongs or interacts with: family, friends and other communities.
Macrosystem	Social and cultural norms valuing: qualifications and academic achievement; the quest for knowledge and discovery; interest in technology and so on.

Table 2: Bronfenbrenner's ecological 'levels' from an Activity Theory perspective

The ecological environment can be seen as constituted by a set of nested layers or systems which directly or indirectly affect the individual. Cole (1996; 2003), reminds us that the individual and contextual levels are mutually co-constitutive, that is both the activity the subject are actually part of the wider context. Cole's (1996) "concentric circles" modelling of context, the 'culture as garden' metaphor, helps us keep in mind that influences do not necessarily

flow sequentially between 'levels' but rather tend to flow in all directions and across all levels as represented by the arrows in figure 8 below. Cole *(ibid.)* also notes that there are two classes of concerns for the researcher to take account of: *what transpires in the activity system under investigation (the garden) and what transpires around it.* These two classes of concern cannot be addressed independently of each other since changes that are initiated within any activity system will inevitably have an impact on the other surrounding activity systems. Awareness of this interdependence and of the contradictions and dissonances that arise between the various levels will provide a better understanding of the activity system under investigation. These considerations have been examined earlier in this thesis when dealing with the wider contextual issues affecting current perspectives and assumptions surrounding ICT. In figure 8, successive ellipses represent 'activity' at different levels which are interdependent (represented by the double-headed arrows): just as the garden is dependent on the larger ecological system within which it is embedded. Figure 8 illustrates how Cultural Historical Activity Theory can be combined with the notion of ecology in diagrammatical form:

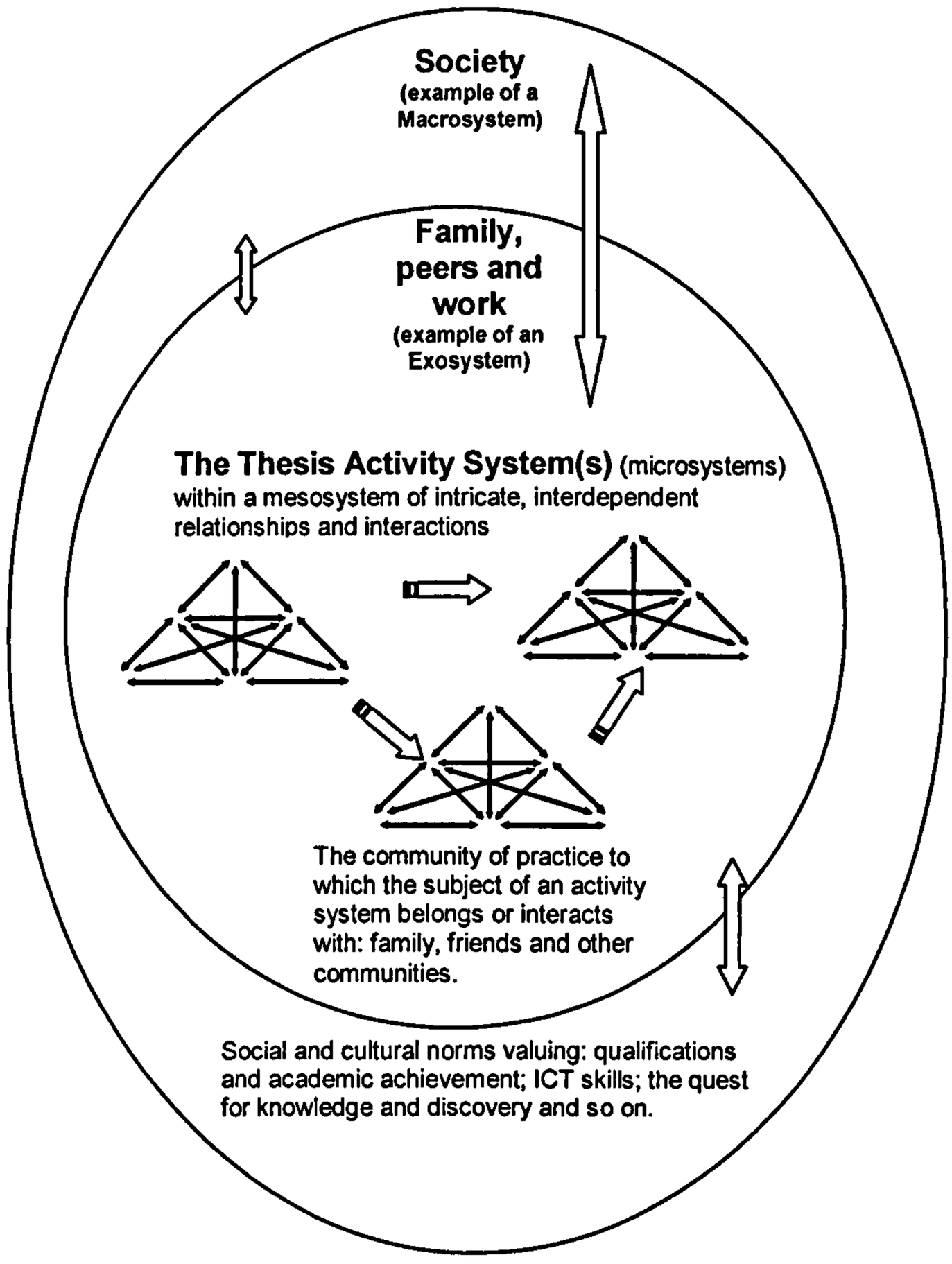


Figure 8: Ecological levels and Activity Systems (after Cole, 1996, p.300)

The different activity systems such as writing, reading and discussing for example, all produce outcomes which themselves become the object of other activity systems. The findings of this thesis, (the thesis may be viewed as an activity system) for example, should produce outcomes which will subsequently serve as objects for transformation into other outcomes by the larger activity system of local government. In other words, the thesis (a series of micro-systems) will affect what goes on at an exo- and macro-system level in the community (ICT in schools in Gibraltar).

6.2 An 'operational' model

The Activity Theory framework that emerges is one that can be used to inform the process of data gathering and its subsequent analysis. The model developed for this study is broken down into distinct stages, based on the constituent elements of Engeström's (Engeström,1987;1999) activity triangle: subject; instruments, artefacts and tools; object and outcomes; rules and norms; community; division of labour. These were used as a basis for questions asked in the interviews. These stages also helped to organise the data, help to delineate and frame the interview data and realise the activity triangles. This involved the transposition of the components of the activity triangle, in terms of the situation being examined, onto a diagrammatic representation of an activity system.

The analytical tool, a 'Checklist' was developed from research into the use of Activity Theory in the workplace (Mwanza, 2002) and adapted for use in domestic contexts is shown in table 3, below:

NODES OF THE ACTIVITY TRIANGLE	QUESTIONS BASED ON 'NODES'
Activity	What is the activity in question? Composition of main Activity? Are there sub-activities? What are the Actions? What are the Operations?
Object	What are the physical tools, ideas, concepts, objectives (as in 'aims') being 'worked' upon?
Subject or subjects	Who is undertaking the activity: who is the learner?
Tools and artefacts	What are the physical tools, ideas, concepts or other people used in the mediational processes? What tools does the subject use to accomplish the objective? How are the tools used? What are the affordances of the tools?
Rules and norms	How do cultural norms affect, constrain or govern the activity? What rules or norms affect the way the subject tackles the objective? What are the rules and norms in the immediate environment? What are the rules and norms in the outer contextual layers?
Division of labour	Who does what? How are roles assigned and organised? How does the division of labour affect the way the subject tackles the objective?
Community	What does the social environment of the activity consist of? How many people are involved?
Outcome	What are the outcomes of the activity? Do they match the original objectives? Are there any dissonances, breakdowns or focus shifts? How are these resolved? What learning has taken place?

Table 3: Using Activity Theory to inform research questions (adapted from Mwanza, 2002)

Table 3 is designed to be used as a checklist to ensure that all relevant areas are covered. The notion of a checklist as an aid to research and interviews based on Activity Theory was developed by Kaptelinin, Nardi and Macaulay (1999), aware that activity theory does not provide ready-made solutions that can be directly applied to specific problems. The original purpose of a Checklist in Kaptelinin et al. (*ibid.* p. 28) was to help in the design and evaluation of computer technology in the workplace from a mainly purely Human Computer Interaction perspective (HCI). The 'Checklist' above, is used as a tool to help with the asking of meaningful questions.

The interview questions themselves were based on the questions shown in the checklist. The methodology also takes into account the work on Activity Theory undertaken by Engeström (Engeström,1993) and Kaptelinin (Kaptelinin,1996). The analysis of the data is based on the 'triadic'

relationships, or the 'sub-triangles' formed by what is best described as a 'nodal triad', that is the three main components of a mediated interaction within an activity. Examples of these could be the triads formed by the following nodes of an activity triangle: **subject - tool, instrument or artefact - object** or **subject - rules and norms – community and so on.** The types of questions asked (shown in table 4) in the research interview are essentially questions designed to further explain and clarify the role and function of these triadic relationships and their place within the activity system in question.

6.3 The Interviews

Typically, in an 'unstructured' interview, the interviewer has no rigidly set questions or question order. The interview may in fact appear to have all the attributes of a conversation rather than a research instrument, with the course and direction of the interaction dictated by the immediate context. Semi-structured interviews, as the term itself implies, are more 'structured' in that there are predetermined questions although the order can be changed according to the interviewer's perceptions. The wording of the questions themselves may be changed to suit the circumstances and explanations or prompts given to different interviewees as necessary. 'Rambling' and 'going off the point' may actually be encouraged through the use of these explanations and prompts to provide further insights into the interviewee's perspectives. The potential to generate descriptive data and to fully explore issues are particularly attractive features of this type of interviewing, as opposed to the more rigid structured interviewing techniques. Cohen, Manion and Morrison, (2000, p.270) point out that the more one wishes to gain comparable data - across people and across sites - the more standardised

and quantitative one's interview tends to be become. The more one wishes, conversely, to acquire unique, non-standardised, personalised information about how individuals view the world, the more one veers towards qualitative, open-ended, unstructured interviewing. It is a matter, as they (*ibid.*) write, of 'fitness for purpose' with techniques chosen from a continuum ranging from the completely and rigidly structured 'questionnaire' type interview to the fully unstructured interview in which the respondent, as much as the interviewer, has control over the interaction.

Bryman (2001, p.314) suggests that a semi-structured approach to interviewing is most useful where the researcher begins the research with a fairly clear focus rather than a notion of wanting to do research on a topic. Similarly, Robson (2002, p. 278) points out that semi-structured techniques are advisable where the researcher has a 'shopping list' of topics and questions and want to get responses to them. Semi-structured interviewing still affords the researcher with a great deal of flexibility and opportunities to explore issues in-depth and, if required, there is no reason to preclude an unstructured section or components within the semi-structured interview design.

The persons involved in the interview are known to have been involved in specific ICT activities and they were asked to focus on these where appropriate. The first part of the interview involved questions designed to put the interviewee at ease, explaining what it is that the research study entails, asking contextual questions about their ICT equipment, usage, their environment and their preferences and so on. Although all the interactions with the interviewees provided 'pictures' of ICT activity, the richer ones were the ones that, after a short time, became 'conversations' with the interviewer. In

practice, the distinction between interview sections became diffuse and indistinct.

The structure of the interviews was based on the main areas of inquiry using the components and nodes of the Activity triangle (Engeström, 1987; Cole and Engeström, 1993).

6.4 The structure of the interviews

Interview questions were prepared to gather contextual, 'exo-system' (and also macro-system data) about the context of young people's ICT learning (see appendix 3). This section of the interview asks a number of general ICT-based questions used to elicit more general information about the subject's involvement with ICT. An interview guide was also prepared. The 'interview guide', Robson (Robson, 2002, p. 281: citing Lofland and Lofland, 1995) reminds us, is to ensure that we have "a list of things to be sure to ask about when talking to the person being interviewed". At the same time, the interview guide should have enough inherent flexibility to ensure that there is as little as possible 'premature closure' of the focus of the research questioning. This approach uses a basic checklist to make sure that all relevant topics are covered. The questions themselves allowed for relative flexibility and scope in how the interviewee was engaged to maximise the information obtained and fully probe the issues. This involved an awareness of the existence of several distinct question types, characteristic of qualitative research interviews (*vide*, Kvale, 1996, pp.133-135). Kvale's *(ibid.)* typology includes questions described as: 'introducing', 'follow-up', 'probing', 'specifying', 'direct', 'indirect', 'structuring' and 'interpreting' and these are all evident in the interview guide prepared for this study.

The topics addressed cover much the same issues identified in the literature reviewed in earlier sections of the thesis and are similar to the type of question asked of respondents in similar studies (e.g., Downes, 1999; Sutherland and Facer, 2002) where the researchers were attempting to gain information about their computer use.

6.5 The interview guide

The areas covered by the interview guide were based on the components of the Activity Triangle and this involved the translation of these components and nodes into a set of questions with which to investigate the activity. The basic questions are as follows:

1. "Young people teach themselves." What do you think about this statement?
2. How would you say *you* have learnt about ICT?
3. How do you think *your friends* learn about computers?
4. Do you ever help your friends or family members with ICT?
5. Do you talk about computer related stuff? If so,
6. With whom?
7. What do your parents think about your ICT use?
8. Are you allowed free access to your equipment?
9. Where is your ICT equipment located?
10. What is the ICT activity you spend the most time on?
11. Which task did you choose?
12. What can you tell me about this task?
13. Did you have to learn anything new in order to do the task?
14. What did you actually have to do?
15. Why did you choose this task?
16. Have you ever done anything else like this before?
17. Did you find the task difficult?
18. Were there any problems or setbacks?
19. Did the equipment give you problems?
20. Did the software give you any problems?
21. Did you have to discuss this with someone?
22. Did you use books, magazines, internet sites?
23. Did you use anything else to help you?
24. Is there anything you would like to ask or tell me?

Table 4: The question set

The Checklist was also used along with the interview guide to ensure all areas of interest were covered and the questions and answers were nominally coded according to the Checklist. Table 5 shows how question set relates to the Checklist:

Question number	Link to Checklist
1, 2, 3, 10, 11, 12, 13, 16, 24	Activity
13, 15, 17, 18,	Object
5, 6,	Subject or subjects
5, 6, 17, 18, 19, 20, 21, 22, 23,	Tools and artefacts
7, 8, 9	Rules and norms
14, 17,	Division of labour
3, 4, 5, 6, 7, 21, 21, 22,	Community
11, 12, 13, 15, 17, 18, 19, 20, 24	Outcome

Table 5: Nominal relationship of question-set to Checklist

It is clear that the questions relate to the Checklist in many ways and on multiple levels and the relationships depicted in table 5 are only intended to provide a general indication of the Activity Triangle node to which the question can be linked since it will always be difficult, if not impossible, to completely isolate the elements of an activity system from each other.

The 'tasks' offered as an aid for the respondents to focus on were themselves collated from the *IT User Skills Framework* put forward by a steering committee of industries and government organizations reflecting the diverse needs and perspectives of education and business (E-Skills UK, Final Report, March 2003). These were also cross referenced against several current GCSE and Vocational A-Level specifications currently used in schools to ensure there was a good spread of ICT skills which ICT-adept young people would normally be familiar with.

6.6 Choosing the subjects for interview

There was no underlying logic or rubric guiding the sampling choices made, other than evidence of an ongoing engagement with ICT and a certain measure of expertise. The group of young people chosen as participants for this thesis were selected purposively, that is to say, they were chosen because they demonstrated traits and characteristics that were found to be 'interesting' from the research perspective. The 'sampling', therefore, is based on non-probability criteria. A degree of 'snowballing' (Cohen, Manion and Morrison, 2000, p.104) occurred, that is, where an individual or instance points towards another case or instance. As a result, young people were chosen because of referrals by other young people leading, in turn, onto other contacts and 'leads'. Both convenience (ibid., pp.102-103) and ease of access were also important considerations, given the number of networks and social groups that contact with just one young person led to. The terms 'opportunity' or 'accidental sampling' (ibid.), then, are an accurate description of how the interviewees were chosen.

Paradigmatically, this study is interpretive in nature and utilises qualitative methods; the notion of 'sampling' is therefore used rather more loosely than would perhaps be the case in quantitative research. The subjects are not meant to be 'typical' or representative of the general population or, indeed, of young people (although they well may be). They are individuals who happen to have high levels of ICT skills and who have, apparently, developed these skills on their own. Although the thesis centres around these 'case studies', the use of the term 'case study' has been avoided as a descriptor, primarily, because

of Robson's (Robson, 2002, p.177) caveat about using well-worn terms like 'case study':

> ... for all such terms carry 'excess baggage' around with them, surplus meanings and resonances from these previous usages.
>
> (Robson, 2002, p.177)

Bassey (1999, p.35) also points out that there are a range of possible interpretations of the term 'case study'. The six cases are, however, studies of six different 'instances' of ICT use. This involvement with ICT is presented as an 'Activity Profile' for each subject. There is no intention to draw inferences or generalisations from these 'profiles' and the associated data. As Bassey *(ibid.)* argues, an essential feature of the 'case study' is that it involves the collection of sufficient data to be able to explore the significant features of the case and to put forward interpretations of what is being described. This is what has been attempted in this study.

6.7 Ethical considerations

Wellington (2000, pp. 54-57) reminds us of the ethical and moral obligations of those involved in educational research. All the processes and stages involved in the production of this thesis have been undertaken with Wellington's (*vide*, ibid, p. 57) eight rules which, essentially, hinge on being frank and acting with complete integrity and openness.

As an educator, the researcher is morally bound to at least inform the interviewees about the nature of their activities and to heighten awareness of the implications of, say, downloading music or sharing copies of software amongst friends. Of course, this is not the intended purpose of the research project, particularly given that many of these activities will seem, on the

surface, harmless enough and will be rarely construed by young people as constituting 'theft' or 'bad'. This is another reason why monitoring software was not used as a data collection tool since it would mean having access to all aspects of computer use whether the subject wanted this or not.

The interviewees were also told beforehand that they had an opportunity to 'opt out' after listening to the interview recordings, as it happened, none of them had any problem or felt threatened in any way by the researcher's mention of 'illicit' activity, especially in respect to copyright violations or intellectual property rights issues.

The subjects were initially asked verbally if they wanted to participate in a study about their use of ICT in their homes. This was then followed up by a telephone call to their parents. In all cases, both the young people and their parents were personally known to the researcher and there was already a relationship of trust established due to personal and professional reasons. In a community the size of Gibraltar, anything else would have been surprising but, in any case, the subjects were also given a letter for their parents explaining the purpose of the research and seeking their permission for the interviews. A copy of the letter is provided in appendix 4. In all cases, permission for the interviews was granted verbally. Jenny, Kyle and Mary were invited into the researcher's home for the interviews. At least one of their parents accompanied them and remained close by whilst they were interviewed. Peter and John were also interviewed in the researcher's home given that they are close friends of his children and were visiting anyway. They were accompanied by their father and a friend. Jimmy, Stuart and Billy were interviewed together in the headteacher's office at their school.

Direct questions that could lead to interviewees to talk about unsavoury subject matter or copyright issues were purposefully avoided. The interviewees were also told that anything which they did not want recorded or in any way used would be struck off the record. This presented a problem from the onset since much of the time young people did not really know what is 'legal' and what is not. Copying music CDs / DVDs, the downloading of music, films or software are examples of activities that, more often than not, are termed 'illegal' because of copyright issues. Questions to do with downloading from the internet and copying digital media were kept in the interview schedule because what was of interest here is the technical skill of producing copies of digital content or the expertise required to download digital content from networks. Questions to do with the actual content of digital materials were specifically avoided unless the interviewee steered the interview in this direction.

The whole question of 'legality', 'legitimate use' and ICT is a veritable minefield, with issues of software copyrighting and protected digital content being very difficult to avoid completely. In any case, interviewees were informed that anything 'incriminating' they may say would not be used and struck off the 'record'. These concerns were discussed with the parents of the interview subjects when permission was sought for the interviews. All of the young people involved and their parents are known to the researcher and are familiar with the nature of the research interests of this thesis.

Chapter 7: The Interview data

7.0 Introduction

The interview sessions were recorded in digital format and the resulting files were copied on to a portable computer for storage. Digital recording systems, as opposed to the more traditional cassette-tape recorder and microphone system, work by 'compressing' relatively large volumes of audio into smaller data files. Accessing any given segment portion of a digital recording is also much faster, as is the repeated playback that is so often required when analyzing data. Copying and backing-up the resulting data-files is also made much easier given the digital format of the resulting files.

The recorded portion of the interviews lasted, on average, an hour each. The actual duration of the *whole* interaction with each subject was effectively longer than that reflected by the duration of the *recorded* portion of the data collected. The recording of the interviews had to be handled with a great deal of tact since, initially, all except one of the young people interviewed expressed their concern about being asked about their computer activities and the fact that a 'record' of their responses was being made. The recordings were made available to both subjects and their parents immediately after the interview. Two of the interviewees, Peter and John did not wish to be interviewed on their own and asked for a 'joint' interview. Jimmy, Billy and Stuart also preferred to be interviewed together. Sufficient data was collected to enable the creation of individual profiles for all interviewees. Random names have been chosen as pseudonyms to identify the subjects.

7.1 Interview 1: Peter and John

Peter and John are 17 year old twins. Their level of ICT expertise, their thinking and attitudes towards technology are very similar. Tom, a friend, and also 17, attended the interview session because the twins asked him. When quizzed about this, they said that they did not feel very confident about 'computers' and ICT and felt that Tom would be able to support them in case they were asked 'technical' questions during the interview. They felt they could rely on Tom's expertise given that he was studying ICT at A-Level and was, according to them, very good with computers and ICT in general.

At the time of the interview, both were studying for their A-Levels (Design and Technology and English Literature). One of Peter's main ICT activities is the production of graphic product designs for his Design and Technology A-Level. One of the main motivators, therefore, for ICT activity in the home is related to the transformation of objects (objectives into outcomes) stemming from school-based tasks. Similarly, one of John's main reasons for using ICT is the production of coursework and assignments for his A-Level literature course. Although they are both doing the same A-Levels, they tend to concentrate their computer and ICT use on their respective 'preferred' subject area. They both have access to up to-date computer equipment and there are two computers in the house, one shared by Peter and his brother and the other is used by their parents. They have a good quality printer and they both have the capability of copying compact discs (CDs) and Digital Video Discs (DVDs) should the need arise. Their parents are quite supportive when it comes to the purchase of ICT equipment and will generally try to procure whatever it is that the twins ask for. Their parents have, however, resisted a

broadband connection for the home on the grounds of constituting an unnecessary, recurrent expense. At present the telephone and internet charges are less than what it would cost to contract a broadband connection. They have promised Peter and John that they will buy them laptop computers, 'web-cams' and pay for their broadband connections if they manage to get to University. One of the things they will look at when choosing universities, the twins have said, will be the quality and type of internet access available in the residential areas. The parents agree that this is important.

Apart from school-related use, their ICT use is also related to their involvement with music. They are both engaged in the creation of a music collection in digital format. The objective is to make it easier for them to compile music play-lists for their digital music players, commonly known as 'mp3' players. Both also download musical notation and song lyrics from websites for their guitar playing and are familiar with techniques used for searching for information on the internet, especially if connected to music.

The most commonly used software is the ubiquitous 'office' package comprising of word processor, spreadsheet, presentation and e-mail programs. There is also a sophisticated graphics processing program installed in their computer which is not part of the standard package normally purchased for home use. Much of the learning, for Peter and John, has revolved around the use of this software.

There is internet access via a 'dial-up' connection which is by far the cheapest option. The subjects commented that at the moment there are no plans to upgrade this to a faster, 'always on' broadband connection because, as Peter points out: "...there is no need; we don't use the internet enough to

warrant spending money on it." Both claimed to use the computer an average of three to four hours a day during term time. This use is not subject to any restrictions on the part of their parents, that is to say, there are no limits on the time they spend at the computer or what they actually do with it.

Games playing also forms a large part of both brothers' leisure time although they state that they do not normally play games on their computer and prefer playing on a dedicated games console. Interestingly, they both dislike playing games on their computer because installing and playing with this type of software creates problems of a technical nature and they confess to not having the time, or the inclination, to 'waste' on technical problems. They find computer technology to be too 'unreliable' when compared to games consoles.

Both the twins demonstrate a sound understanding of the limitations and capabilities of the technology and demonstrate remarkable insight into these issues:

> **Researcher:** Games consoles or PCs?
> **Peter:** PCs are too much hassle. The thing is every time I install a game my computer always ends up crashing and I've ended up with defunct computers so many times like that...just unlucky I suppose.
> **Researcher:** That's also ICT, it is 'communications technology'
> **Peter:** ...but I don't trust computers, I trust consoles...
> **Researcher:** I can't guess what you are thinking but...is it that the console is actually more reliable than the PC?
> **Peter:** Definitely...
> **Researcher:** ... for games...
> **Peter:** ... that's what it is made to do...for the PC games are just an 'add-on', they are not really what computers were designed for. It is something that people manipulated the computer to do, I suppose,
> **Researcher:** That's interesting...other young people have said exactly the same thing, my Nintendo or what have you, never crashes and if it does, I just reset it and it carries on working, whilst with the PC its always the graphics card, the resolution, this or that or the other, its always messing me up...
> **John:** Games aren't made specifically for a computer, like maybe you get it and then you have to lower the...

Peter: ...you have to adjust the computer to the game!
John: But with the console, that's it, you put it in and it works.
Peter: But, if you know about computers then it's not such a big problem.
Researcher: What you are telling me, I suppose, is you don't have the time to mess about with the computer and what you want to do is enjoy a game...
John: Exactly! Also what annoys me about computers is that you don't get everything from the game unless you go and upgrade it, like, maybe you have to upgrade your console every five years but during those five years you get games, and they will be evolving because, you know, technology...you can fit more into it... but you know, it's quite solid, it does not really change that much over those years but you do have to pay more money to play the new games and maybe it's not every five years it's every couple of months you need to upgrade the computer to play all the new games they've brought out...

They also realise that young people tend to be more adept at ICT than previous generations and are obviously capable of engaging in discussions on the matter. This is explained using the example of their own grandfather. He has had problems learning to use the DVD player, they muse, let alone the computer. When asked why they thought this was so they both agreed that it was because young people have grown up with the technology and take it for granted. As Peter and John point out:

Peter: And also we've been growing up with technology and you mainly do most of your learning whilst your my age...I guess, and I'm guessing you get set in your ways so he grew up without any technology and we've been learning stuff like that when you press a button stuff does this and stuff does that and when you press the button the TV turns on. He didn't learn that when he was a kid (laughing). We've kind of have grown up with it, its standard you press a button and it does something.
John: It took us ages to teach him how to use the DVD player, so you can imagine the computer!
Researcher: So what you are saying is that age does make a difference...
Peter: ...but, I don't know how stuff is going to evolve but I can't imagine us being older...his age... and finding technology...
John: ... as daunting.
Peter: As daunting as he finds technology, now, because it can only really evolve now but it started after he'd really grown up.

Surprisingly, Peter and John say they are not 'good' at ICT, yet they know enough to be able to teach each other:

> **Researcher:** Do you consider yourself to be good at ICT? Like, I'll give you a prompt to help you understand what I mean, do you help other people? Do other people ask you to help sometimes?
> **John:** Umm, I taught him (points to Peter) pretty much how to use 'Paintshop Pro' (a graphics program).

John 'experimented' with the software and managed to teach his brother how to use it. The strategy, John says, is to interact with the software, ad hoc, until enough familiarity is gained. John describes this experimentation:

> **Researcher:** Right, so you've got a certain element of expertise there...how did you teach yourself?
> **John:** I...just tried out everything. I just basically...messed around with it until...you know...what's that? Find out what happens...just click on everything basically. I pretty much now know how to use the entire program.

Although they confess to not having too much patience when it comes to sorting out technical problems, they are willing to invest as much time as is necessary to learn how to use the software:

> **Researcher:** Is it a particularly complicated program to use?
> **Peter:** Yeah, it is...initially.
> **John:** Yeah it is, it can be quite...because there are so many different things you can do...and just, you know...emmm, you've got one section, say you click on the top bar and its says 'Colours' and say it has twenty things within that, adjusting all the different parameters, brightness and all that, You can do loads of really weird things. It's quite...compared to Word... its really, really complicated.
> **Peter:** But fairly easy to use once you know how! But initially it took me quite a fair while to figure it out.

After experimentation and 'messing around', there is often a reliance on the 'assistance' facilities designed into the software itself. Most quality programs will include a series of 'tutorials' to initiate the new user. These, along with extensive 'help' sections, will usually provide the new user with enough

information to start off. In Peter and John's case, they reported that there was no recourse to assistance from school:

> **Researcher:** Have you got access to anyone who could...who really knows...to an expert in that program who really knows how to use it and you could tap their expertise.
> **John:** No.
> **Peter:** No, no teachers or anything

At home, their mother provides essential support for their ICT use and will usually go to great lengths to sort out their ICT related problems. The twins use their mother's expertise as and when they need assistance, although this will usually be related to the more technical problems, rather than something associated with learning how to use a particular application. Their mother, for example, will fix a variety of computer problems:

> **Researcher:** What do you do when that happens (problems with computer equipment):
> **John:** Call mum!
> **Peter:** Yeah!
> **John:** Usually we try a few things that we have picked up like (defragment if it's going too slowly) and if it's still going really bad we've had to quite a few times which is just wipe the whole thing...I can't remember what it's called but you completely wipe everything and start from the beginning.
> **Researcher:** You've just said "Call mum". So can I presume that at home mum's the expert?
> **John:** Yeah.
> **Peter:** Yeah.
> **Researcher:** So presumably when you where younger, mum led the way?
> **John:** The only reason I know about 'defragmenting' is because my mum taught me about it.
> **Researcher:** So you know about how to 'defrag' the hard drive because your mum taught you, yeah?
> **John:** Well, I know it can be done, I haven't tried...but...but.. yeah, I can figure it out.

They both admit to knowing enough to identify *what* needs to be done although they may not always know *how* to do this. The mother, in turn, has access to a close relative, a brother-in-law, who happens to be an ICT professional and will sometimes revert to him if faced with an insurmountable problem. They both seem to be quite confident and seem to have 'learnt how

to learn' when it comes to computer related issues, that is, they know how to 'figure it out'. Whilst they did not consider themselves to be 'good' with computers, when asked if they were able to build their own computer:

> **Peter:** No, I don't think so.
> **Researcher:** What about you?
> **John:** I mean...no. I mean... if you went on the internet, and say, emmm...got all the information and all that and then just went onto a website and bought all the pieces...then maybe...it's like a jigsaw...
> **Peter:** It'll still be quite hard but I could do it.
> **Researcher:** You'd find it hard, what are you telling me, that you've never had a need to do these things with computers, I suppose?
> **John:** It could be something like if you got a basic layout you could just go, oooh, this goes here and that goes there...and it would be much harder and you would make so many mistakes along the way that probably it wouldn't be worth it.
> **Peter:** People who build their own computers are mainly because...they want the custom thing without the price. So they are, not obsessive but... people who really like computers and know exactly what they want.

They have not learnt how to build a computer because they have not had a need for this. They both acknowledge that they will learn only what they need to and if it is relevant to their immediate requirements. Peter and John are able to interact with a close group of friends who are extremely computer literate and very familiar with technical issues. These friends are also accessed by them whenever there is a need.

7.2 Interview 2: Kyle

At the time of the interview, Kyle was just about to celebrate his 16th birthday. ICT is one of the options he chose for his GCSEs and his reasons for this are that he is an avid computer and ICT enthusiast. He uses his equipment well into the night on most days and he claims that he starts right after school and can be at his computer for five hours or more. He does, however, ensure that he completes all homework assignments first and his parents seem to make sure of this.

Kyle's parents are supportive when it comes to his involvement with computers but do keep an eye on his activities, especially if they feel he is spending too much time in front of the computer. When asked if he is subjected to any restrictions when accessing his equipment, he replies:

> **Kyle:** Well, it depends really, because if I were to use it for schoolwork constantly, I'm sure they wouldn't have any objections but maybe, like...after so many hours of, like, playing a certain game or whatever, they may encourage me to take a break or to go outside...
> **Researcher:** So they do monitor your usage?
> **Kyle:** Yes.

His parents have obviously facilitated the technologically rich environment which he enjoys. They have three computers networked wirelessly together to enable the sharing of their broadband internet connection and a printer / scanner combination. Kyle will usually have no problem getting his father to purchase upgrades, whether software or hardware, as and when required. His idea of a Christmas or birthday present is, in fact, a new part for his computer or a similar piece of equipment to upgrade his machine and his parents will usually oblige. This is, no doubt, related to his parent's awareness of Kyle's interest in the technology and of his plans to study computing at AS / A Level with a view to taking this up at University.

Both his parents are computer literate although Kyle feels his father is the real expert. Kyle's sister is also keen computer user. Both of them have a computer system in their respective rooms and his parents have access to a laptop in the living room. The network enables the sharing of files and documents.

Kyle's equipment is relatively up-to-date with a DVD player/writer, a modern printer and scanner combination and a good quality, 'flat' display screen. He feels this is important, given the time he spends at his computer.

His keyboard and mouse are wirelessly connected to his computer and he does tend to keep up with technology, especially when it comes to new games. Most of Kyle's leisure time is spent playing games, on-line, with other friends. These 'friends' could be in Gibraltar or as far away as Denmark as they are part of an on-line gaming community. The games technology he uses also allows for simultaneous voice communications between players and the topics they talk about will be linked, usually, to computers and games in general.

Kyle is thinking of choosing A-Level Computing after his GCSEs because he feels that he is good with 'computers' and cannot really think of doing something not involving the use of computers. When asked what he wants to do at University, he is quite vague and limits himself to 'something to do with computers'. Kyle generally thinks he is quite good at ICT:

> **Researcher:** Do you think you are good at ICT?
> **Kyle:** Yeah, I'd say I was quite good.
> **Researcher:** Do you think you are an expert?
> **Kyle:** Maybe not an expert, but close!

But his perception of 'expertise' seems to be coloured by the notion that to be 'good' is to be good in the 'technical' sense. He does not think that he is 'technically' good:

> **Researcher:** Would you be able to fix, repair your equipment, by and large, you know the day-to-day stuff that goes wrong?
> **Kyle:** I'd probably seek help on the net because, like, 'technically' I'm not very good. I possibly couldn't repair my PC but I can seek help on the internet with like, tutorials on troubleshooting.
> **Researcher:** Did you say 'technically' you are not very good?
> **Kyle:** 'Technically', I couldn't repair my PC, if there's a fault or whatever.

Yet when questioned about what he can and cannot do, he seems to be able to help his friends with 'technical' problems and has managed to build his own

computer workstation whilst indulging in some computer programming using, arguably, quite sophisticated programming languages. He admits to having recovered lost and damaged files, formatted his hard-drive and re-installed the operating system software and helped set up a network, all of which would require relatively advanced, 'technical' skills to accomplish.

There are two main motivators for Kyle's computer use: leisure and school. Surprisingly, school-led usage in the home does not take up an overly large amount of time, given that Kyle is about to sit his GCSE examinations. Even at this juncture, Kyle says he most of his time at the computer is spent either playing games or chatting to friends on-line:

> **Researcher:** What sorts of things do you use your PC for? Games, chatting with friends, school work, what can you tell me?
> **Kyle:** The primary thing I use my PC for is, really to play games. I also chat a lot, I use 'MSN Messenger' and MIRC and stuff like that. Also, when I type out an essay for English or a piece of course work, I use the word processor.
> **Researcher:** You use the word processor. Is that the program that you most use, do you think, when you are doing school work?
> **Kyle:** Yes, for sure.

The most commonly used software, when not playing games or chatting, is the word processor given that most of school-initiated usage involves the writing-up of coursework and other written assignments. Kyle also uses the internet to access a number of educational web-sites for revision purposes and taken advantage of an always-on internet connection to revise for his GCSEs in conjunction with close friends. This seems to have replaced more traditional face-to-face meetings in each other's homes:

> **Kyle:** Well, I have just done my GCSE mocks and to revise for those I'm using this program called 'Skype' where with a microphone, over the internet, you can talk with your friends and it's very near 'phone quality so there are hardly any drawbacks using that. Since you are paying for ADSL anyway, you are not charged for any additional 'phone calls or anything

like that. I found it very, very useful because I have like a conference call and maybe I'd revise with four or five of my friends at a time, if I wanted. So I found that very, very useful!
Researcher: And did it work?
Kyle: Yes.

Kyle explains that he would have been bored studying and reading books by himself and that he found revision and study much easier this way. He observes that he would have found it "a lot harder to study" had he not revised this way and admits that perhaps he "wouldn't have studied as much". Kyle also uses a spreadsheet when he has to but is more familiar with the industry standard database package that comes with his office software. He does not use his office software for anything other than activities related to school work.

Listening to music is something that Kyle clearly enjoys and he has managed to copy all of his extensive music collection onto his computer. He has arranged it so he can listen to music on his computer whilst simultaneously undertaking other tasks, such as the playing of games. The digital music format allows him to compress otherwise large volumes of music data into smaller digital files and even though he does not think of himself as a technical expert, he clearly knows the correct jargon and terminology to allow the exchange of information with friends and knows enough to explain his preferences. He has even installed an extra hard drive in his computer to use for extra storage. His computer is used as the hub of a personal entertainment and information centre:

Kyle: I 'rip' them onto my PC.
Researcher: Sorry, what word did you use?
Kyle: 'Rip'.
Researcher: You 'rip' them into your computer.
Kyle: Or let's say that I like a particular CD but someone else in the house wants to listen to it at the same time, I make like another 'copy'.
Researcher: So you make copies of the songs, you've obviously paid for the CD anyway...but you are listening to music on your PC.

Kyle: Yes.
Researcher: What's the advantage of listening to music on your PC rather than on a hi-fi?
Kyle: On some mp3 players or whatever, you have to use batteries or on a hi-fi you couldn't equalise the sound as well as you perhaps could on a PC, you could, like, tune it better.
Researcher: I should have asked, Do you have a hi-fi?
Kyle: No, I don't actually.

A fast, 'always on' internet connection has made a marked difference to the way the computer is used by the whole family, not just Kyle. Since his sister, for example, can access his computer over the network, she can also listen to his music collection. His mother, Kyle says, is also using their laptop much more and is learning fast. The whole family seems to be motivated by the added incentive of broadband internet access:

Kyle: My dad's good but my mum...recently she started using the internet more, she's making use of it more since we had ADSL. She can connect any time she wants and she's learning quite quickly, actually. My sister also, she's quite good. That is also to ADSL, I'm thinking, because she's encouraged to use the PC a lot more.
Researcher: That's interesting, so when did you get your ADSL?
Kyle: My ADSL? Maybe a month and half ago.
Researcher: So since that time, your mother's using her PC...
Kyle: Well she hasn't actually got a PC of her own. She uses my father's laptop.
Researcher: OK. She's using it much more, and your sister, is she using it much more?
Kyle: She used to be quite...like...just used her PC for schoolwork, and that's it, nothing more.
Researcher: Does she now use it for schoolwork?
Kyle: Yes, she uses it for schoolwork like she did before but now she is using the CHAT more and she's made her own website and stuff.

Kyle describes his father as 'good' with computers and as someone who helps and supports whenever there is a need. He took him to Spain, for example, to purchase parts for Kyle's computer building project, something which he thought of doing himself. Kyle explains that he did not know what to do at first and his father had to help him with the actual building of the new computer. He adds that because it was his first time, he had to experiment

and use a trial and error approach and also ask for help, "I just tried to place bits here and there but I had to get help from my father." He used his father's 'knowledge' to assist him but he also had to access his friend, Albert, to complete the project.

Kyle belongs to a community of friends who are also heavily involved with computer activity. There is a 'hierarchy' of expertise, with Albert at the top, Kyle second and then everybody else. Many problems are solved by asking Albert or Kyle:

> **Kyle:** I have quite a few of my friends who would 'phone me or another friend that I have. My friend Albert is the one really that would know the most but I'm like around the second there, so if there are any problems, they normally call me first, and if I couldn't sort it out, they'd call Albert.

Kyle, however, seems to be more accessible than Albert and is sometimes used as an intermediary and facilitator:

> **Researcher:** So if your friends have any queries and they can't get hold of Albert, presumably they ask you?
> **Kyle:** Yes, they will ask me. I think they might ask me first.
> **Researcher:** Why is that?
> **Kyle:** A lot of the time Albert since he has a separate 'phone in, he may be using it or whatever, whereas they could ring me very easily and if I had a problem I myself could call Albert to find out for them.

Kyle's main strategy for overcoming problems and setbacks of a more technical nature is through experimentation, 'messing about' and asking his close friends or father. 'Play' clearly forms an important part of his daily computer activities. As he explains:

> **Kyle:** Well, I've formatted my hard drive and restored the operating system. I also helped my friend set up a LAN party at his house.
> **Researcher:** What was a LAN party?
> **Kyle:** It's setting up a LAN network...
> **Researcher:** What's a 'LAN'?
> **Kyle:** It's a 'Local Area Network', it's just like a group of PCs linked together... and the purpose of this is just to play games but in an actual LAN party so you play games, multi-player, with your friends... I went over to his house to

help him set it up.

He has learnt a lot about networking and how the internet works by the playing of collaborative, networked games. Game playing is clearly something that motivates and challenges him and it is this sort of activity which seems to spur his interests. Play, experimentation and 'trial and error' seem to be important factors in the way Kyle learns, especially when it comes to sorting out technical problems and Kyle seems quite clear about how he 'thinks' he learns:

> **Researcher:** But how have you learnt those things?
> **Kyle:** Just by messing around with software and hardware, installing them here and there just to see if it works but other than that, that my secondary use now would be ringing a friend if I had any trouble... or wanted to learn something new, my friend Albert would teach me or show me.

Kyle seems to perceive the computer as something that is to be experimented or 'messed about' with whenever there are problems or setbacks arising out of his day-to-day usage. This would seem to give Kyle the confidence to tinker with settings and open the actual computer case and so forth, knowing that whatever happens, the chances of lasting damage are minimal, for him at least, the workings of the technology seem to have been 'demystified' somewhat. Kyle explains that he thinks young people tend to mess around with technology once they have overcome a fear of 'breaking things':

> **Kyle:** They just mess around with settings or just try to plug things here and there until it works. Just play around with it, basically.
> **Researcher:** Have you ever damaged your computer by playing around with it?
> **Kyle:** No, luckily, I haven't, no.
> **Researcher:** Do you know of anybody who has busted it up or spoilt it by fiddling with it?
> **Kyle:** No, I've never heard anyone doing that!
> **Researcher:** So nobody has 'broken' their PC by experimenting with it. That's an important point because it is the kind of equipment that is ...
> **Kyle:** Versatile?.
> **Researcher:** Versatile. That's a good word! Is there something special about the equipment that 'invites' people to experiment with it, do you think?

> **Kyle:** Some people may be a bit intimidated at first because it's sort of electronics and might think it's a bit 'iffy' and wouldn't know how to go about it. Once you learn it's not too hard.

He tells the interviewer, for example, that when his machine overheated he opened the case and poked about in its innards to experiment a little. In more difficult cases, however, Kyle will ask another person, usually his father or his friend, Albert, for an initial 'clue' or hint about how to resolve the problem, as he points out: "Well, he (Albert) told me it was an overheating problem but I sort of experimented by myself, took off the case...". As a result of overcoming his own problems, a bank of knowledge seems to be gradually built up and it is this repository of experience which also enables him to help his other friends out. The immediate community of friends and family, then, sustains itself and seem to be self-supporting when it comes to technical issues because they will all have access, directly or indirectly, to this experiential repository.

Play and experimentation are also strategies also used by Kyle when it comes to using ICT applications such as the word processor. When asked how he would learn to do something 'new' by 'messing around' he explains that most of the time it arises out of a need to find out how to do something quite specific.

Problems and setbacks arising as a result of software use seem easier to resolve, although it is evident that there is a 'time' element involved given that trial and error, experimentation and 'messing about' by their very nature as strategies are intrinsically time-intensive activities:

> **Researcher:** Could you give me an example of what you mean by 'messing around'?
> **Kyle:** Messing around?
> **Researcher:** Well, let me give you an example. You are doing something for school and, say, GCSE English they are asking you to do a magazine article,

in columns, how do you do that? Who taught you how to do that?
Kyle: Well, at first I didn't know so I was experimenting just like trying to 'click' a lot of different buttons and a lot of the sub-menus until eventually I got the sub-menu I wanted which was 'text' and 'formatting' and I could choose 'columns' there or 'double-spacing' and things like that which was all in one menu.

and with a reported time of some five hours a day spent in front of the computer, time is certainly something which Kyle clearly has.

The actual design of the software used by most young people is also something which seems to lend itself to experimentation and learning by trial and error given that most applications tend to follow a standard layout and tend to provide tutorials and aids to guide the user:

Researcher: Is there something about the software that you use that invites people to experiment with it.
Kyle: Quite a lot of Microsoft programs are very user, like, user friendly, they have tutorials or troubleshooting guides and it's just very easy to experiment with.
Researcher: So the software in general is easy to 'pick-up'?
Kyle: Yes, very user friendly in that way.
Researcher: Because?
Kyle: Because, just in the way it's been, like, 'set out', really with tutorials and all that.
Researcher: So programs are set out the same?
Kyle: Yes.
Researcher: The program itself more or less 'helps' you use it?
Kyle: Yes! It's not very open ended in that way so you can click on a general area, like, on the menu and you sort of get the menu that you want.
Researcher: So it's quite, you said, 'user-friendly'. Are most programs like that?
Kyle: Most programs that you have to pay for, I'd say! There may be some that aren't very 'user friendly' but then again you can get help, over the internet, for them anyway. Stuff like MS Word and MS Excel I find them to be very 'user friendly'.

Kyle explains that once he has learnt how to use one or two mainstream software packages, such as the word processor, the use of the other applications becomes much easier because of common formats, menus and layouts. This also applies to the major games he plays as they also follow a

common format. Where this is not the case, he will have access to guides and tutorials that are supplied with the software packages and applications. It is significant to note that Kyle does not think he has learnt his computer skills on his own even though he is, physically, alone in his room for most of the time. The technology of ICT itself facilitates his learning and he does not feel alone or isolated. After being asked if he felt he had taught himself, that is, on his own, he explains that he is 'alone' only for an initial period of time because most of the time, he communicates and shares his problem with those in his community:

> **Kyle:** No! At first, for the first ten or fifteen minutes but then after you are still stuck and don't know what to do, you probably get advice from a friend or family member or somebody that knows.

7.3 Interview 3: Jenny

Jenny is thirteen years old and at the time of her interview had just chosen her options for GCSE. She is currently studying for an ICT GCSE, privately. There are a large number of girls at her school that are also doing the same; deciding not to take up GCSE ICT at school but instead opting to do it privately. The reasons for this are not clear. Jenny says that she does not think that the facilities at her school are good enough but when asked why she thought this, she was not able to provide any convincing evidence other than hearsay and what other girls had said about ICT at the Girls' Comprehensive. It seems that it is possible for them to do the ICT GCSE a year earlier than at school and it is this that seems to be the main reason behind the decision. It would then be possible, Jenny admits, to undertake an extra GCSE in Year 10 instead of the ICT, which she had 'got out of the way' a year earlier. When asked why she chose to do ICT as an 'extra' GCSE, she replied that it was a subject she

found particularly easy and she did not think it would require too much of an effort to complete. Quite apart from this, she also said that ICT was a qualification 'worth having' anyway.

Jenny has her own computer equipment in her bedroom, except for a printer which is shared with the family by means of a wireless network. Her equipment is not new, having being handed down after her brother upgraded his own system. She does seem to mind this, saying that what she has is perfectly adequate for her needs. She has access to a broadband internet connection, again, shared by the family over the wireless network.

Despite using her brother's 'cast offs', the equipment she has is relatively up-to-date, with a good quality flat-screen monitor, loud-speakers, microphone, CD-writer, web-cam, digital camera, access to a scanner and an 'always on' internet connection. She has recently asked her father to upgrade her hard-drive as she is running out of space to store her music files and photographs. This is something she feels she cannot do herself.

Her home is a technologically rich environment, with a wireless network connecting the three computers in the house facilitating the sharing of files and documents. Jenny is capable of using the network to share music files, school documents and to access the printer in her brother's room. She is also able to troubleshoot network problems when she has to but will usually ask her brother or father to do so first.

She has digital music players, a sophisticated mobile telephone, games console, her own flat-screen television with access to a large number of satellite channels and her own digital camera. Both her parents are ICT literate and they share a computer. She has a seventeen year-old brother who is a

keen games player and a bit of an expert when it comes to computers. He has his own equipment in his bedroom. Both her parents have access to the internet and a laptop computer and are ICT users although her father seems to be more of an expert. Jenny is never short of help when she has a computer related problem and has recourse to friends who are able to provide support. It is her brother, however, who will usually be at hand. As she explains:

> **Jenny:** I wouldn't call myself an expert but I know quite a lot of stuff. I learn from my brother and I usually tend to ask him when I have a problem but my friends come to me most of the time.

She reiterates that she is not an 'expert' several times during the interview, yet when more 'technical' points arise, she is able to discuss them with a confidence that seems to belie her own perception. When asked, for example, what she can and cannot do with computers, she comes up with a number of relatively sophisticated tasks and activities ranging from the manipulation of digital music tracks to the design and creation of her own website. She is also capable of recognising when her computer is in the grip of a 'virus' or other piece of errant software and can rid her system of such attacks. She is also able to engage the interviewer in a conversation and clearly understands the dangers of accessing the internet 'unprotected':

> **Jenny:** There's these websites that people go to, let's say I go onto this website and it says 'If you want to access this website you have to download bla bla bla bla...' and you don't know what it is and you are tricked into clicking, like, 'Yes' to download, and then it might be a virus so it could be like a search bar or...
> **Researcher:** What do you call those programs that you download, people trick you into downloading them? I asked you a question about that before!
> **Jenny:** (hesitates) Trojan, sorry...
> **Researcher:** Why would it be called a Trojan, think about history.
> **Jenny:** The Trojan Horse! It was a horse that looked like a present and had the Greek soldiers inside so when it was opened the Greek soldiers came out...
> **Researcher:** So this works in exactly the same way?

Jenny: I suppose the website could be the horse and then these viruses are coming out they are the Greek soldiers! I was actually talking about that before with my friend.
Researcher: What, what?
Jenny: Because she went 'Yes, I have this Trojan.' And she goes, 'But why is it called a Trojan?', and I told her! You've just asked me...
Researcher: It's a Trojan then because of what you've just said. A Trojan horse.
Jenny: Yes, I explained to her what I explained to you!
Researcher: A Trojan horse looks like a gift...
Jenny: But the inside was full of...
Researcher: And it was really dangerous wasn't it?
Jenny: Yes. Greek soldiers!
Researcher: And lethal! These websites that attract you onto them...
Jenny: ... look like something really nice. Usually websites attract children with glittery stuff and 'Yes, you can put this onto your PC and...'...
Researcher: ... and what they do instead is...
Jenny: ...they insert a virus, the same as it if were the thing inside the Trojan horse!
Researcher: And it messes up your computer, surely.
Jenny: Then you've got to run a load of anti-virus programs.

Whilst she may not seems to consider herself to be an 'expert', it is clear that the amount of time spent in front of the computer has exposed her to a large number of problems and setbacks that she has had to deal with and seems to have accumulated a substantial knowledge-base.

She also seems to be selective as to the experiences she actually thinks are useful and those that are not. When talking about how problems are dealt with, she said that the contents of her computer had to be completely wiped clean and the software reinstalled. This is quite a complicated procedure and is not something an 'average' computer user would attempt or necessarily need to know. Jenny knows that as long as she has recourse to someone who can do it then she has no need to actually learn the procedure herself:

Researcher: Who did that?
Jenny: My dad.
Researcher: Were you watching when he did that?
Jenny: Yes.
Researcher: Did you learn how to do it?

> **Jenny:** (Laughs) Some of it... I didn't really... I wouldn't know what to do exactly...
> **Researcher:** If you HAD been paying attention, would you be able to do it?
> **Jenny:** If I really wanted to, I would ask him how to do it and... I'd figure it out!

She says that she will learn something when she feels there is a need for a particular skill set:

> **Jenny:** ... I suppose if ever I want to do something with PCs when I'm older, when I move out, I suppose I'll want to know so I probably will have to ask him...

and continues to explain that there are some things that have to be learnt because she uses them frequently and is therefore more familiar with them, whilst the need for other things occur less often:

> **Jenny:** Some things you have to know how to do like for example, how to change your password, if you are somewhere else and not in your house, and you don't have your brother or dad to ask so what I do? I'm stranded. I have to know certain stuff from the top of my head. There's some things that I doubt I'll come with... like rebooting Windows every single day, you know what I mean? So that's something I wouldn't normally use.

When asked to clarify this further, she links what she learns to the frequency of use of a particular application or procedure. The more she needs to do something, she explains, the more she will learn about it:

> **Jenny:** I suppose it's the stuff I use on a day to day basis, like MSN. I know everything about it. MS Word and MS Excel and MS Powerpoint, like the Office programs, stuff I use a lot in school, I need to know. My teacher calls me a brainbox because whenever he asks a question I'm the only one with my hand up, either they don't know or they are not bothered! They are not bothered about learning. I'm the only one in my class that likes PCs.

The skills she has picked up, then, are a reflection of the frequency of her usage. She is thus very adept at clearing her computer of viruses, downloading and manipulating music, sorting-out problems related to on-line chats and recovering passwords, setting up a web-cam, using the computer as

a communication and entertainment centre, using a word processor, spreadsheet and other common, 'office' applications needed for school-based activities.

There are occasions, however, when she is forced to learn something because of a pressing need and she will learn how to do something because of the gravity and 'urgency' of the problem rather than because if is something she thinks will be a common occurrence. Network problems, for example, are not something she will try to fix herself unless she is not left without any other choice and cannot access her father or brother. She explains that these problems do not occur frequently enough for her to bother learning about.

Jenny describes, for example, how she solved the problem of a lost password. Her need to solve this problem drove her to learn a procedure that enabled her to access her chat account and continue with her online activities. Her first recourse, in this case, is to ask someone, first her brother who in turn asked someone else, then her friends and then the internet:

> **Jenny:** Yes. Like today, I was having a problem. I forgot my password for MSN and I couldn't get into my account so I had to figure out how to change it. My brother had forgotten and none of my friends knew so I typed in 'Google' and asked how to change the password but it gave me something completely different so I had to carry on changing the phrase until I typed in 'MSN account password' and it told me the website to go to 'member services – how to change my password'... I couldn't get into it, I forgot my password. Usually when you forget your password, a secret question pops up and only you know the answer, but I couldn't remember my secret answer!

She eventually found a webpage explaining how to circumvent the password protection on her chat account, thereby solving her problem.

She claims to spend some three to four hours a day at her computer and her activities stem from both academic and leisure needs. Her broadband internet connection, she feels, has really changed the way she uses her

computer. She feels, for example, that she does not have to keep a watchful eye on the time spent on-line and can afford to spend as much time as she needs to on the internet using her chat program, looking up information, learning about website design and so on:

> **Researcher:** I see you have a broadband connection, has that made a difference to the way you use your computer?
> **Jenny:** Yes, I have more freedom now. I don't have to be on for a certain time. Like now I've learnt...the three or four months I've had broadband I've been able to take, like seriously, a big leap in what I've learnt.
> **Researcher:** How come? Talk a bit more about this.
> Jenny: Before I was only allowed an hour on the internet, for example. In an hour I basically would be on the CHAT because I didn't have the time for anything else!
> **Researcher:** Why were you only given an hour?
> Jenny: Because it costs money, it's expensive if you know what I mean. You have to... broadband is the same amount every month so I suppose its better... and it's me my brother and my dad using three PCs at the same time so without ADSL, with Dial-up, it would be really expensive.

Jenny frequently accesses the internet as an aid for revision, especially for mathematics. Her brother, she explains, helps her to choose reputable websites such as the BBC or Channel 4 so she is sure that the material she finds is suitable. She does admit, however, that most of the time is spent either playing games or chatting to her friends:

> **Researcher:** How often do you use your computer, roughly?
> **Jenny:** About three or four hours day.
> Researcher: Does this cause problems at home, with you using the computer so much?
> **Jenny:** Not really because it is in my bedroom so I have free use of it whenever I want to.
> **Researcher:** Does mum or dad say, "Stop using the computer", or that kind of thing?
> **Jenny:** Sometimes, but most of the time I'm allowed to use it.
> **Researcher:** What sort of things do you use your computer for? Games, CHAT, school work?
> **Jenny:** Games, usually but I use MSN to chat to my friends and when I have something to look up in the internet, for school work, I use it too.

Her favourite program is her chat program which allows her to communicate with her friends, share files and documents, see and hear each other by means of the web-cam and microphone combination.

Apart from her communications software, she is most familiar with the ubiquitous home / office suite comprising a word-processor, spreadsheet, database, e-mail and internet browser which has more or less become the industry standard. The office suite is mostly used for school and study purposes given that many school assignments can be word processed. Tables and graphs are produced in the spreadsheet program:

> **Researcher:** Give me an example of the 'school work' that you use it for.
> **Jenny:** Like, when I have to write a story for English, I use MS Word or make a graph I use MS Excel...
> **Researcher:** So you use your word-processor and MS Excel?
> **Jenny:** And looking up information from the internet.

She seems confident when faced with problems and setbacks and has learnt to tackle these systematically:

> **Researcher:** Right...if it's MS Word that's acting up, or the spreadsheet doesn't work properly, do you manage to sort those type of things out yourself?
> **Jenny:** Yes. It's usually sometimes when I have, let's say, in MS Word, let's say for example, a story that's long and it takes a long while to load... let's say you are also using another program at the same time so you'd have to shut those down to...
> **Researcher:** So you have to shut down everything else?
> **Jenny:** Let's say I'm on MSN at the same time, I'd have to close MSN, Media player and just leave one thing at a time.

Jenny is quite sure that she learns more about ICT at home than she does at school and suggests that she finds current school ICT quite frustrating. There are a number of reasons for this, time being an important factor given that at home she is almost unrestricted in her access to the computer and the internet. There are rules, however, her parents insist that homework and

schoolwork is finished before she can use her computer or go on the internet.

It is this sense of freedom, she explains, that helps her progress:

> **Jenny:** I have freedom at home, if I want to learn this today, I'll learn that. At school I have to stick to what everyone is doing. If we are typing, he puts an overhead projector, he puts like a story, usually on the PC I'm quite fast at typing but everyone's with two fingers typing and I type quite fast...

Jenny does recognise, however, that school has had some impact when it comes to learning ICT but still feels that she has somehow taught herself. When asked if she learnt in school, at home or was taught by somebody else, she responds:

> **Jenny:** A bit of the three of them because we started learning in Yr. 4 , in Middle School, and we started with Word, in Yr. 5, Excel until we got to PowerPoint but now in Yr. 8 we are going all over the basics again! So that's school done! Then if I have problems I just ask people, right? Or I went to the library and with the computers there I found out and taught myself, experimenting, trial and error.

All school did, in her case, was to provide her with what she calls the 'basics'. When asked as to how she learned to use the word-processor, a common school application, she does admit that she was taught something whilst in Middle School but feels she had to fend for herself. The ICT teaching at school seems to have served to introduce the main applications and software but, she explains, more advanced skills such as producing a newspaper layout, for example, she had to 'figure it out' for herself:

> **Jenny:** I've taught myself, really, because when I started Middle School... they teach you the basics like how to change the font and stuff but that doesn't really help you in the sense, like, if you needed to... set up columns in a newspaper article or something, I'd have to figure it out myself or ask my brother or my dad.

When asked to clarify what she meant by the term 'figure it out', she explained that this usually involved trying things and seeing if they worked or not. Jenny

adopts a trial and error approach whenever she faces a new challenge to do with the use of her computer. She provides an example of her thinking as she navigates the program's 'menus' to try to arrive at a solution:

> **Jenny:** I basically... like on the top you have the 'toolbars' and it has 'File' and stuff. You just have to look through all to see what I could find and, for example, 'columns', I looked up... I just thought... something 'familiar' to 'columns' like the 'format' settings and... kind of worked it out.
> **Researcher:** What sort of word would you use to, I mean...
> **Jenny:** Experiment. Experimenting with the word processor.

It is obvious, from what she says, that the experimentation and playing about with the computer does not just involve random 'clicking' on just any computer buttons or controls. There is every indication that she knows enough to help her identify, with a degree of approximation, the most appropriate control menu of the computer which will afford her with the solution she is looking for. She seems, therefore, to have some idea of the general direction in which to direct her efforts when it comes to 'figure it out'.

Jenny describes how she tends to use this 'trial and error' approach whenever she is faced with a problem or setback:

> **Jenny:** ...with my PC, with everything. Like when I didn't know how to add a new background to my 'desktop', I looked through all my personal settings... I found 'Browse' and the picture I wanted wasn't there but 'Browse' took me to my pictures and I could just basically put whatever I wanted on it...

and she seems willing to invest the time needed to learn in this fashion. She does point out, however, that the computer and software itself provides some sort of structure that, once the basics have been learnt, helps the user find the answers sought. When asked if she really did learn on her own, that is to say, with no external help or support, she quickly replies that she did not:

> **Researcher:** Completely on your own? No outside help?

Jenny: No.

When prompted to continue, she explains that she also relies on the built in tutorials and help files that are usually included in most software packages:

Researcher: Would it be fair to say that the computer itself helped you, then?
Jenny: Yes, because if, for example, let's say I'm searching for something and I don't know where to find it, I just go to 'search', for example, I type in what I'm looking for and it helps you.

There are occasions, however, where some learning seems to have occurred incidentally as she plays about with settings and controls when she has had nothing else to do:

Jenny: Yes! Sometimes I stumble on stuff! I'm just messing about with my PC, looking through my documents, searching for random things and something comes up! 'Oooh, I didn't know this,'...
Researcher: So what is it, when you are bored you start messing about with the computer?
Jenny: Yes, when no-one's on the CHAT or I don't really want to play games, I just... randomly... search for stuff.

Many of her problems are also solved by asking people around her. The first port of call seems to be her brother or father, but if these are not accessible, she will ask her friends. It seems the chat community is always available to lend a helping hand. Apart from being a powerful communication tool, the software she uses is also itself a valuable means of solving problems:

Researcher: Do you have friends who are also interested in computers?
Jenny: One or two of them.
Researcher: Girls or boys?
Jenny: Girls. Most of the boys I know, know quite a bit about them, about PCs so if I have problems I ask them.
Researcher: How do you ask them?
Jenny: Over the CHAT!
Researcher: So you use ICT to help you with ICT!
Jenny: Yes. They are roughly at the same level as me so we know most of the same stuff so if I have a problem with something that's simple that I've just forgotten how to do, they are there to help me.

An example is provided by her as she tells the interviewer how she went about designing and constructing her own website by collaborating with friends. Again, the software and ICT equipment she has access to seem to have facilitated the key interactions between the group of friends. Jenny saw that some people had their own websites and found the idea interesting. After discussing this with one of her friends, she was informed that there were websites which offered free web space and tuition about web design. She searched the internet and found one of these websites. She explains that she chose the 'beginner' option because as she says, it was the first time she attempted to do this:

> **Jenny:** I went on another website and basically it gives you a free website. You have 'beginner' or 'advanced' so I chose 'beginner' as I'd never done one before, it takes you step by step about how to do everything. You can put different backgrounds, upload pictures onto it, adding paragraphs and anything you wanted.

She progresses quickly and explains that, aided by the website, she soon becomes more adept and manages to move up to 'advanced' which as she describes, enables her to do more herself:

> **Researcher:** So you found a website that actually teaches you how to make a website?
> **Jenny:** Yes, and I've made a couple in the space of time up to now and now I'm on 'advanced' the only difference is that it doesn't guide you step by step, you just do everything yourself. So instead of having the 'beginner' choice like step 1, adding a background, instead of having choices you just do everything yourself because I've already leant how to do it!

Her group of friends quickly finds out about Jenny's newly learnt skills as she adds her website's address to the signature or 'nick' when she goes online. The others also go on to the website and learn about the creation of their own personal sites on the internet:

Researcher: Did any of your friends do any of this stuff as well?
Jenny: Yes, it's actually caught on! I put my website on my MSN 'nick' go to 'bla bla bla' and now twenty or twenty five people have already asked me how to make a website! Everyone's making a website!
Researcher: So you started it and now all your friends have their own website?
Jenny: Yes, it's like a craze.

It is clear that Jenny feels she learns about ICT by 'messing about', playing and experimenting with her ICT equipment and it is this that has led her to become more confident in its use. When asked if she thought young people learnt ICT on their own, she responds:

Jenny: It's true! Like, I was giving an example before, it's basically by experimenting. Let's say someone has a problem, they just go on their PC and experiment. They type in different stuff in Google to try and find out different ways or the resolution of a background... they carry on experimenting which one suits them best... it's trial and error most of the time.

This in turn leads on to further experimentation and 'messing about' because, arguably, increased confidence leads on to her having less of a fear of breaking things. She also knows that if anything does goes wrong, she has recourse to a number of people and resources that can be used to help.

7.4 Interview 4: Mary

Mary is also thirteen years old and has a profile that is very similar to Jenny's. Jenny seems to recognise this, in fact, when she tells the interviewer which of her friends is 'good' with computers:

Researcher: Which of your friends is really good with computers?
Jenny: Mary, her parents are roughly like my parents, all their PCs are connected wirelessly and their printer wirelessly and everything is roughly the same as us...

Both profiles are similar, especially in terms of the family environment and attitudes towards computer use in general. There are a number of computers in her home with a wireless network being used to share a broadband internet

connection. She feels her computer is up-to-date and says that there would not be any problems when it comes to having her equipment upgraded or purchasing new items. This, she says, is because her father is himself very interested in ICT and technology:

> **Mary:** Yes, he's a computer addict! We've got two computers, one for myself and one for my dad. My dad has one laptop himself, so does my mum and my sister's going to get her own computer! So, yes! We have loads of computers!

She also considers herself to be quite fortunate when it comes to the support she gets from her father:

> **Mary:** I have a printer, scanner, I have most things because my dad gets them mostly for me as he is very interested in computers.
> **Researcher:** So your equipment is quite up to-date, is it?
> **Mary:** Yes, I can really get most things I want. If I'm doing a project I can print, I can scan or I can copy.

Her father is, in fact, a computer professional and this is why there is a very positive attitude towards the technology in this particular household. Mary's mother is also an ICT user and has her own laptop, also sharing the internet connection. There does not seem to be any real problems when it comes to providing ICT equipment and of course, the broadband connection. Mary comments that at first she was not interested in ICT or computers and only started using it because her father gave her one. Even then, it was not until her friends told her about the possibilities of always being in touch online that she really became 'hooked' and starting using it to any great extent. Her main motivation seems to be the chat program and the opportunities it offers:

> **Mary:** Well, really I was never really interested in computers until my dad gave me one, so I started... started looking through... until I heard of MSN from my friends so I started going on it and then I got hooked! And then I searched for other websites that other friends gave me.

She identifies her father's expertise, and his acting as a facilitator, as being a reason for her being good with computers and ICT. She also tells the interviewer that this is also the case with one of her friends in particular and goes as far as to extrapolate this to her friend. She finds that both of them are 'lucky' because they have no need for external support whenever they have problems with their equipment or applications. When asked how she felt that her friends learnt about ICT and computers:

> **Researcher:** Right. This group of friends that you chat to most nights, how do you think they learn about computers?
> **Mary:** Jenny and I are quite lucky because both of our dads are quite good at computers but some people, I suppose, they might ask us or they might need a man from the shop to do it for them so I'm quite lucky, and so is she, that we've got our dads to help us.

Mary also explains that most of her friends actually comment on just how much technology there is in her home. All the members of the family have their own computer although at the time of the interview, her younger sister shared one with Mary:

> **Mary:** Mine is in my bedroom. My dad's is in this boxroom... and his laptop... well he takes it anywhere... and my mum also...and my sister will have a computer in her bedroom.

When asked if she felt her parents actively encourage her computer use, she suggests that they are actually quite proud of her skills. She points out that whilst her parents do not actually expect her to use the ICT equipment; they do not control her use either:

> **Mary:** Well, sometimes they do tend to make fun of me and say, 'She's a 'whiz' on the computer'. I can't really help it. I do go out, I'm not 24/7 on the computer. I don't see it much as 'encouraging' me but... (pauses)...
> **Researcher:** That's fine. But they don't stop you?
> **Mary:** They don't stop me either...

She does add that she will always ensure that school assignments and study are completed first and explains that these are not necessarily her parents' rules but her own as she thinks school is very important.

A broadband connection for the family has also meant that Mary spends more time using her equipment. When asked about the time she spends at her computer, she tells the interviewer that the 'always on' availability of the internet means that she spends a substantial amount of time 'on-line'.

> **Researcher:** How often would you say you use your computer? You can tell me in hours a day... or I mean... do you come home from school and immediately get on it or...
> **Mary:** Well... it depends because I can go on any time I want because I have ADSL so... yes... I take advantage of the fact that I have it so I do go on a lot.

She also comments that a computer without internet would be of little use to her and finds it hard to imagine what it would be like without this access:

> **Researcher:** Well, would you use it the way that you are using it if you didn't have ADSL?
> **Mary:** No! Well, I'm not sure because at the moment I'm addicted to the internet because the internet is a big thing and you can do a lot with the internet and a computer without the internet is, for me personally, quite dull because you can't really do anything. Apart from playing 'Solitaire' or something!

Even though she has designed and constructed her own website in collaboration with one of her friends, Mary does not seem to think that she is 'good' at ICT, in spite of what her parents think. She explains that she sees the computer as a tool for 'fun' and does not perceive herself as being a 'dedicated' user who puts the technology to more serious use:

> **Mary:** ... well I'm not very dedicated to the computer like with other things. I go, like I said, mostly on it for fun! I don't go on it for, basically, work... work... work... like some people have laptops for that.
> **Researcher:** So some people that you know have actually bought themselves laptops because they are really into ICT and all that?
> **Mary:** They might need to take it places... so they do their essays or whatever on it...

Mary tends to ask her father whenever she encounters setbacks in her day to day use as he is clearly the household expert. She also tells the interviewer, however, that some of her friends actually ask her about computer problems. She admits that she would require some support and 'a plan' for her to be able to undertake more complicated tasks such as deleting all software off her computer and reinstalling it. If she were absolutely forced to do so, she would 'probably manage to do it' by herself, she explains:

> **Researcher:** ...do you ever help your friends. Not that they ask you but in school or if they go to see you? Do you ever help your friends or other family members with ICT problems?
> **Mary:** Yes, maybe but they'll have to be small problems that I can manage myself because, like, for example, the re-formatting, that's something I can't do but like I said, if I had a plan of what I had to do, exactly step by step, I would probably manage to do it.

Mary tells the interviewer that she believes in trying to sort out more complicated problems and setbacks for herself because this is the way she learns. When asked if she is able to alter the 'resolution' of her display, something which is a recurrent problem with many games, she says:

> **Mary:** I don't know what you mean by that!
> **Researcher:** ...to make the screen bigger or smaller and the 'icons' bigger or...
> **Mary:** Ah, yes... I know how to do that! I tried experimenting by going to 'Tools' and stuff and then I figured out how to do it myself.
> **Researcher:** Now this is a very difficult one, difficult because it could be anything! Troubleshoot, fix, repair your equipment? So if you have a problem would you be able to tackle it yourself?
> **Mary:** Like I said, I would try experimenting myself with the little knowledge that I know of the computer and, like I said, if I don't know I would ask my dad... and that way I learn more!

Mary feels that she learns about ICT by experimenting, trying things out and asking others. She acknowledges that school has also had a role to play even though what is taught there is 'backwards' and explains that that there is

an element of taking things for granted when it comes to using software. Mary finds it is a matter of 'common sense', whilst for others, she feels it may not be as easy:

> **Researcher:** So, how would you say that you've learnt about ICT?
> **Mary:** Well, basically, a bit of help from the school even if they teach a bit backwards because... you might think that something is common sense like for example closing a window, by clicking on the cross but, some people, it doesn't come to them and I thought it was common sense, but for me it was easy and I learnt from school, from my dad, from friends, from everywhere, basically!

She reiterates the fact that for many young people, computer use has become a matter of 'common sense' and second nature and seems to ascribe the ease with which many young people engage with ICT to being 'brought up' with the technology:

> **Mary:** For some people it's common sense but for some other people you think... well... 'I don't know how to do this! I haven't got a computer at home but some people think, 'Well, you should know!' But you should know that for you, you've been brought up like that and for other people, they haven't!

She finds that young people tend to experiment and 'fiddle about' with computers and software applications and suggests that young people experiment when they do not have anyone readily at hand to ask for help or support with problems:

> **Mary:** ... well, many people that don't have the advantage of someone to go to, tend to fiddle about with it and learn themselves so that gives them an opportunity to see what else you can do with the computer.

Experimentation and generally using a trial and error approach, seems to be a major strategy used by Mary. This, she explains, is how she would find out more about software features she may not be too familiar with. She says she normally clicks 'on everything' in order to see what things do and what actually

happens. This, for example, is what she does if she is asked to help someone else out. A common, standard software layout and design seems to provide a familiar framework within which to work. Once some familiarity has been gained, it becomes relatively easy to navigate her way around the software package, in this case, they talk about the word-processor:

> **Mary:** Probably, yes. I would browse through 'Tools' or 'Options' and I would just 'Click' on everything and see what everything does and meanwhile trying to look for that, I'll learn something else.

She also points out that, for her, whatever knowledge or skill that is picked up by exploring in this way, is always a bonus:

> **Mary:** Yes. I would use 'experimenting' probably. Like I said, if you try and look for something but then you on another thing, well you've just learnt another thing, haven't you? So you've learnt twice in a row!

She will also share what she picks-up with her friends whilst talking to them on-line but this information, she says, is usually related to interesting web-sites she has visited or perhaps heard about.

Most of the computer related activity she undertakes is related to school work, playing games, listening to music or chatting to her friends online. The software application she uses the most for school related work is the word-processor and clearly feels very comfortable with. She explains that it is 'the easiest thing' she 'can do on the computer' and has few problems when it comes to understanding its use and potential. Mary visits a lot of websites and some of these actually 'infect' her machine with so called 'spyware' and other malicious software. She does not seem overly concerned about this because her father periodically 'disinfects' her machine for her. Although she suggests she is perfectly capable of 'cleansing' her machine, it seems her father prefers to do this himself by periodically examining her machine:

Researcher: Is dad or mum concerned about what you can access, sometimes accidentally, on the internet?
Mary: Well, nearly every month my dad checks the computer for viruses. Like, just recently he had to re-format everything. He had to take off everything I had on my computer. He said I had a lot of junk on my computer. Sometimes I try to open the Spyware and take off the
most that I can, but he does it mostly.

When asked if she is capable of doing this for herself, she explains that she is certainly aware that there is software on the market that would help secure the computer from these 'infections'. She normally runs this herself but she also seems to feel more confident about the operation if her father does it for her. Again, she reiterates the importance of trying things out for herself and experimenting in order to learn:

Mary: Well, I would do the best I can by loading the anti-spyware that I have but otherwise I would just ask my dad.
Researcher: Say that you go home now and find that there's a virus in your computer, would you try and get rid of it yourself first and then ask your dad or would you go immediately to your dad without you trying?
Mary: No. I always try myself because trying yourself you learn better, in a better way, so I think I do it that way.

She also explains that she is not concerned about breaking her computer or damaging software by constantly experimenting and using this sort of trial and error approach. When asked if she was worried that this could create more problems for her, she admits that once her computer stopped working and 'crashed' but that this was not too much of a problem. She also seems aware of the fact that computers can and do go wrong and seems to accept this as a fact of life by saying that 'that happens to every computer':

Researcher: All this experimentation... aren't you worried that you are going to break your computer by experimenting with it, or it's not a problem... you think?
Mary: I don't know, I've never thought of that. I don't think that ever occurred to me, really.

Researcher: I was going to ask you, actually. Have you ever damaged your computer by clicking on stuff, clicking on icons and things like that?
Mary: Well, the most I've done is it's crashed, but I think that happens to every computer, but no, further than that, no, nothing.
Researcher: So it's not the kind of thing that's going to stop you from experimenting.
Mary: No.

It is clear that Mary enjoys a substantial degree of confidence about her capability of managing the solving of problems and setbacks, even if she does not, arguably, do all the 'solving' herself. It seems to be this confidence in her resources, for example her father, that underwrites her strategies for learning.

Mary, for example, does not learn to do things that she knows her father can do, especially if they involve complicated procedures. She does, however, know about these procedures yet is hesitant when it comes to actually undertaking them herself. She seems to know more than she is actually aware of, confusing an understanding of what the tasks involve with the actual 'doing' of these tasks and operations. This is particularly evident when discussing one particular occasion when she encountered a major problem with the functioning of her equipment. In reply to a question about whether she learned from her father by watching him remove everything from her computer for a subsequent reinstallation, she explains that she did watch him but 'he did it too quickly':

Researcher: Did you watch him whilst he was doing that or he just did it when he formatted the hard drive?
Mary: I did watch him but he did it too quickly so I wasn't very sure!
Researcher: Well, I see what you mean. It's not that you were watching him to see if you could learn. It's just that you were there...
Mary: He just did it like as if I wasn't!

She also seems to imply that she found it difficult to learn from her father on this occasion because he was not performing the procedure in order to teach her.

She did, however, teach herself how to design and construct a website in collaboration with one of her friends. This she did simply because she thought it was 'cool' and had the resources to do it with, in this case, a website that taught her about web design:

> **Mary:** When you see loads of websites that you think are 'cool' with nice things that are in fashion you think 'Well, I've got something to build websites with, so why not use it...

Mary visited the website, downloaded the software and, she tells the interviewer 'started fiddling around with it until I got something'. The collaborative aspect, she explains, arises because she talks about it with her friends and they express an interest in the project. She describes how she found this sort of thing 'quite easy' because of her experience in visiting other websites and 'browsing' the internet:

> **Mary:** Yes, they were interested. They actually asked how I did it. For me it was quite easy because of the computer knowledge I have of browsing through things and hyperlinks and stuff for me that was easy but for them maybe they didn't know.

In this situation, Mary says that she is the one telling the others about the project. The actual design and construction, however, she admits, was accomplished between two of them. Again, she suggests that school actually introduced her to the subject but this was developed by looking at what each other did. Both friends, she says, contributed towards the venture with their own particular expertise:

> **Researcher:** How did you learn to design your own website?

Mary: I did mostly... once in school, but we didn't learn that much... but then... well, just looking at what my friends did... well what Jenny did... because she did her share of the website as well.
Researcher: It was a joint... collaborative effort?
Mary: We both did something that we know how to do.

Again, trial and error and experimentation seems to be one of the strategies used in the development of their website:

Researcher: Did you have to experiment a lot, fiddle about with stuff, when you were doing the website?
Mary: Yes. If we liked, for example, a format, we clicked on 'preview' and if we didn't like it we would do it again, maybe we would highlight it this time or an underline or something simple that would make it even better.

7.5 Interview 5: Albert

Albert is sixteen years old and is generally considered to be a computer expert by his friends, family and teachers. Albert also helps out at a website consultancy and web-design firm belonging to friends of the family in his spare time and has been offered a summer job.

He has several computers at home and he has managed to learn how to network these together himself. He has also built a computer from spare parts and a plastic box to function as a 'server' to 'host' a series of online games for his friends. His more 'standard' equipment includes printers, DVD recorders and players, a relatively fast broadband connection, a good quality, flat screen display panel and an assortment of ICT equipment which he been given or he has purchased. When he was being asked to describe his equipment, he immediately offered to list the technical specifications of all his hardware, which would seem to go some way to confirm his status as expert.

Albert claims that he feels quite fortunate in that his parents buy him whatever he requires in terms of components and software. A chance

discussion with his mother, however, suggests that most of his equipment has been paid for by the money given to him, by family and friends, on occasions such as Christmas and birthdays. That is to say, it is not that he gets everything he asks for; it is more that he uses every bit of spare cash he has to fund his interest in computers.

Albert uses his computer equipment for some four to five hours a day and says he keeps it 'on' for most of the day:

> **Albert:** Its mostly on all the time, I come home from school and I sit down and use it and I might do something else for a while but most of the time I'm using the ADSL.
> **Researcher:** In hours, how often do you use your computer, say, two hours a day, four hours a day?
> **Albert:** Maybe four, five...

He has a faster broadband connection than the rest of those interviewed and this, he says, is down to the fact that his mother works for the local internet service provider and she gets her connection for free. Albert acknowledges that improved access to the internet has also made a significant difference to what he does with his equipment and suggests that for him, the use of the internet constitutes a large portion, in terms of time, of his computer use:

> **Researcher:** Do you find that having ADSL has made a great difference in how you use your system?
> **Albert:** ...yeah, definitely... I can just use... if I have a query or anything I don't know I can just search...because it's always on.
> **Researcher:** Right, so you use the internet as a resource for research?
> **Albert:** A lot of the time, yes.
> Researcher: How often would you say you use it? Say, you come home from school...
> **Albert:** It's mostly on all the time, I come home from school and I sit down and use it and I might do something else for a while but most of the time I'm using the ADSL.

Albert also points out that he uses the internet mostly to look things up for his school work but he also plays online games and finding out 'information and reading about general things'. Albert uses a popular, industry-standard word

processing application. He uses this quite frequently, mostly, to write-up school related work such as assignments or coursework and uses the spreadsheet and database applications that are packaged with the word processor for similar activities, a usage that is usually generated by his studies at school. The software package that he admits to using the most, however, is the ubiquitous chat program. This enables him to communicate with his friends 'instantly'. This type of communications software allows him to be, say, word-processing a document for school whilst monitoring or participating in online chat sessions at the same time. Messages appear in a small 'window' in a corner of the display screen and this enables him to 'keep an eye' on who is doing what. More importantly, this type of software allows users to know if their friends are online and therefore available for chat sessions or games.

Albert tells the researcher that both his parents are 'good' with computers with his mother being the more adept of the two. His father runs his own business and is also 'quite good' but only uses the computer and the internet for a few work related tasks. There seem to be few rules governing the use of the equipment given that Albert had 'free' access to his equipment and the internet from within his room. Albert seems to be able to spend as much time as he wishes on his computer and on the internet and claims he finds himself completely unrestricted. He finds that his parents are extremely supportive and thinks this is because they know it is vital for the world of work:

> **Researcher:** What do your parents think about your ICT use. Do they nag you about using it so much, do they leave it up to you?
> **Albert:** They don't nag me because of using it so much because they know I'm going to go into a profession and it's helping me.

Albert says he also wants to work in the field of ICT and plans to take this up at degree level. At the time of the interview, he had just finished his GCSEs and had opted to do 'Computing' as one of his AS Level subjects. After the interview, Albert let the researcher know that his Computing teacher has asked him, along with a few like-minded friends, to help out with the administration of the school network. Albert also suggested that he perceived this as some sort of indirect praise and tacit recognition of his abilities. He also feels that it will 'look good on the UCAS application' for university if he agrees to help.

The interview did not take place 'face to face' but instead, his ICT equipment was used as a means of communication. Albert claims to have been responsible for introducing a special type of communications software that enables his group of friends to make use of 'internet telephony' to talk to each other. Rather than just typing text messages, they use the software, a microphone and some loudspeakers and enjoy two-way conversations at no cost. Albert was keen to demonstrate the capabilities of the software to the researcher and the opportunity was used to interview him using the same internet telephony software.

When asked, Albert admits to thinking that he is 'good' at ICT and related technologies and does not hesitate to say 'yes' when asked if he thinks he is actually an expert when compared to his friends. Albert says he usually helps his friends with computer related problems when they ask him to but he seems to be to be self-sufficient when it comes to solving his own problems by accessing the internet:

> **Researcher:** Is there anybody out there that you communicate with or talk to, anybody, a friend or relative, somebody that you know that is more of an expert than you, like your 'guru', somebody that you refer to?

Albert: Emmm, no. I'd have to say, 'Myself'!
Researcher: You have a bunch of friends and they all refer to you when they have a problem. Would you agree with that, does that happen?
Albert: Yes.
Researcher: Right. But there's nobody for you to refer to...
Albert: Not really...unless 'Google' is a person!

Albert is clearly seen as the expert within his circle of friends and the internet affords him the information he requires. He tends to use a well-known 'search engine' as a resource and he seems to feel that he has honed his search skills to a fine art. He provides an example of this when he explains how he learnt about setting up a network in his home, '... just trial and error, teaching myself and some documents on the internet that I just searched when I needed to'. Albert expands on this and explains that it was something nobody he knew had done before:

Albert: Yeah, it was something I'd never done or I'd never known of anybody else doing.
Researcher: OK. Did you have to use any other resources to help you learn how to do it? For example, you said, "Documents on the internet". How did you go about searching for them?
Albert: It's mostly typing a phrase or typing my problem into a search engine such as 'Google', most of the time, seeing what came up... and that gave me advice... on how to solve anything...anything that was wrong.

When asked further questions about this, he tells the interviewer that he is quite confident he is able to discriminate between useful information and the not so useful by accessing multiple sources:

Researcher: ...you are asked a question about ICT, something you don't know off the top of your head, right? Like for example, what is the difference between Unix and Linux or something like that. How would you go about finding out about that?
Albert: I'd type, for example, 'Linux' into a search engine and read what it's about and the same for the other...
Researcher: So your first 'port of call' would be the internet, yeah?
Albert: Yes! Definitely!
Researcher: How do you discriminate between 'good' information and 'bad' information? Do you

know what I mean? Some stuff on the internet is a bunch of lies but some of it is very accurate. How do you know what's true and what isn't?
Albert: It's hard to say. I do try to read not just one source but a few.

Albert adds that he would rather work things out for himself in order to solve a problem as opposed to asking someone else to help. School, he feels, did not contribute a lot to his own learning of ICT and computer use, as far as he is concerned, as he tells the researcher, 'I've barely learnt...of what I know, I've barely learnt in school...'. The main strategy he claims to use is that of 'playing around' and 'seeing what works' by experimenting with the equipment and software. 'Finding out' things for himself, in this way, is clearly very important for Albert:

Researcher: ...how do you think you learn about computers and ICT? I mean are you self-taught or you've learnt everything in school or somebody else taught you?
Albert: I've barely learnt...of what I know, I've barely learnt in school...most of it is finding out myself, my own initiative, just playing around to see what works.
Researcher: A phrase that a lot of people have used before is "messing around". Would you agree with that, simply 'messing around' with computers?
Albert: Yes, yeah.
Researcher: Do you think that teaches you?
Albert: Yeah, clicking buttons and seeing what happens and...

He also adds that most of the commonly used software is designed in such a way as to be more intuitive and easy to use and understand. This is also an aid to learning and he finds that this helps him simply because 'some programs are a lot more user friendly and 'inviting' than others'.

It is clear that experimentation and 'messing about' plays a vital role in Albert's acquisition of expertise although he does not seem to rely on this alone. Communication is also important. He says he discusses things with his friends as well, given that they also seem to share the same interest in the

technologies he engages in. These discussions, usually online, may serve to make him think about setbacks encountered in day to day use but this also exposes him to other people's problems:

> **Researcher:** Right. Do you have any friends who are also interested in computers?
> **Albert:** Yes.
> **Researcher:** Is this a large group, a small group?
> **Albert:** Yes, the majority of my friends are interested in PCs and computers.
> **Researcher:** Do you often talk about computer matters with them?
> **Albert:** Yes.
> **Researcher:** Do you ask them or they ask you about computer matters, do you think?
> **Albert:** Most of the time, they ask me.

It is interesting to note that Albert does not say that school does not teach young people anything, when it comes to ICT and computers: only that it did not serve to teach him. When asked what he thought about the way other young people learn, whilst he agreed with the researcher's suggestion that they mostly teach themselves, he also feels that in others people's cases school could have contributed some knowledge:

> **Researcher:** How do you think your friends learn about computers?
> **Albert:** Mostly, I'd say the same way I do. They probably get a bit more in school than I do but I'd say mostly it's playing around, yeah.

Part of the explanation offered by Albert as to why he feels young people tend to learn more ICT at home than at school, is related to the 'time' that is available. This element of 'time' seems to be an important factor which Albert feels contributes to facilitate his learning and explains that this is simply not available within normal school lessons. The notion of what he calls 'freedom' is also an important consideration for Albert when thinking about the differences between ICT lessons at school and the sort of activities he engages in at home. He finds that at school he is will simply not have the time to experiment

or 'mess around' with computers as much as he would perhaps need or like to. The outcome of a school lesson will usually be planned for, whilst learning in the home is not usually as 'predetermined':

> **Researcher:** What are the main differences. Do you think? Why does everybody keep telling me they learn very little at school.
> **Albert:** I don't know... I suppose at home you have everything... you can find out on your own...I find that easier.
> **Researcher:** Can you say a little more about that? Why do you find it easier? Less pressure or what?
> **Albert:** Freedom! You can try whatever you want out and see what works and what doesn't.

Inherent in what Albert calls 'freedom' is the idea that no matter what he does with his equipment in terms of experimentation and 'messing about', the reality is that very little can actually go wrong with the computer hardware itself. Albert does not seem to realise this until he is prompted in a discussion about precisely this notion:

> **Researcher:** Do you experiment a lot with your computer?
> **Albert:** Yeah, all the time.
> **Researcher:** Have you ever damaged you computer because you've experimented with it?
> **Albert:** Yes!

Although he says 'Yes' at first, it seems he misinterprets the concept of 'damage' and he realises this when he thinks about it further. When asked to explain what he meant by saying that his computer had been 'damaged' due to his experimentation, he realises that this was not really the case. The procedure Albert describes in this example necessitates a high level of skill and is not one that would normally be attempted except, perhaps, by other computer 'experts':

> **Albert:** I installed...I booted up Linux off a CD and accessed my hard drive and from Linux accessing it, wasn't readable in Windows.
> **Researcher:** Right, but did you damage the hardware or was it simply the software?

> **Albert:** It was the... I never damaged the hardware itself but it was the software, yeah, I had to format the drive.

Albert also adds that he managed to get his system working again after reinstalling the operating system. When asked if this knowledge gives him a certain degree of confidence, he replies that it does. The implication is that the knowledge that he could do this may make him attempt things that perhaps others would not. He then admits that the equipment is actually quite 'robust' and difficult to physically damage just by experimentation or the urge to 'fiddle about' with it :

> **Researcher:** I'm going to ask you a question about that. Do you think that gives you more confidence to fiddle about with the computer, knowing that whatever you do to it, you can't really damage it?
> **Albert:** Yeah.
> **Researcher:** I mean, you may destroy the software, or whatever, but the hardware is quite...hard if you like...
> **Albert:** Yes, quite robust...

It seems, in Albert's case at least, that this knowledge lead to confidence and it is this that helps to encourage experimentation and 'messing about' with a certain degree of impunity. This seems to be part of what drives his learning, for example, he teaches himself about an alternative operating system by actually installing it in his computer and experimenting with it:

> **Researcher:** Well, you mentioned Linux for example, the alternative operating system, I mean, presumably you taught yourself about that, how did you go about that?
> **Albert:** The same way I go about most things, by seeing what works and what didn't. I started up and... it was a lot different and...just tried different things and...and see what happens...

When asked if he was concerned that this could destroy his machine or somehow damage it, his response seems quite nonchalant, presumably because of the confidence he has acquired:

Researcher: Do you ever panic, when you are doing something with your PC and say, everything goes black or you have a huge problem?
Albert: I don't panic, I get annoyed.
Researcher: So you feel very confident with ICT and the related technology...?
Albert: Yes.
Researcher: Why don't you panic?
Albert: Because I know something has gone wrong that I can probably fix.

Albert also decided to throw what he terms a LAN party, a party for friends where computers are borrowed and networked together to allow user to play games against each other. This sort of party was organised on a 'bring your own computer' sort of basis. The computers he borrowed belonged to his friends and the fact that he started off without knowing exactly how to network them together or if they would be damaged, would seem to suggest an extreme confidence. He explains that he used the internet to access documentary help, he experimented and did things by trial and error until he got the network to function:

Researcher: Right! And how did you learn how to connect them up?
Albert: Emmm, just trial and error, teaching myself and some documents on the internet that I just search when I needed to.
Researcher: What was your motivation? Did you suddenly think, "Hang on, wouldn't it be nice to have a LAN party?" Did you actually want to learn about it because it was something you'd never done before?
Albert: Yeah, it was something I'd never done or I'd never known of anybody else doing.
Researcher: OK. Did you have to use any other resources to help you learn how to do it? For example, you said, "Documents on the internet". How did you go about searching for them?
Albert: It's mostly typing a phrase or typing my problem into a search engine such as 'Google', most of the time, seeing what came up... and that gave me advice... on how to solve anything...anything that was wrong.

7.6 Interview 6: Jimmy, Billy and Stuart

Jimmy, Billy and Stuart are seventeen year old friends who share similar interests. Although at the time of the interview, they were undertaking different AS levels, they are all quite interested in computers and ICT. They asked to be interviewed together and were treated as a focus group. At the time of the interview, none of the three friends planned to embark on computer or ICT related careers.

Jimmy's parents are not very computer literate and he admits to being the most proficient in the family. He has two younger brothers and two older sisters. There are several computers in the household, networked together wirelessly. Jimmy set this up himself, as well as enabling one of the older computers as a 'server' to be used both as a store and player for his digital music files. Jimmy explained that he installed the home network himself. The equipment Jimmy has access to is modern and relatively up-to-date and he assured the interviewer that buying upgrades and spares is never problematic because his parents support his interests. He has three computers, several 'webcams', a scanner, DVD recorders installed in all of them, two printers, a digital camera and a fast, 'always on' internet connection that has been made accessible to all the family via the sharing arrangements Jimmy implemented in his home network. He designs websites for friends and acquaintances and has recently offered his services to a relative in the local business arena. At the time of the interview, he was studying for his AS levels in Mathematics, Physics, History and ICT.

Jimmy is the one who generally helps the other members of the family with computer problems. He explains how he was the only one to initially take

an interest in the technology when he was younger. His mother, a teacher, seems to have depended on Jimmy's expertise and he explains how he ensured she learnt by 'doing' and not just by watching him or having him explain:

> **Jimmy:** She'd started needing to use computers and there was something she didn't know how to do and she'd say, 'Jimmy, come and do this for me,' and I'd do it for her, but then, two weeks later, she'd ask me to do the same thing... and she'd ask me to do the same thing... and I'd get annoyed with her and I'd say, 'Mum, look, this time I'm going to do it but I'm going to explain to you what I'm doing. Watch what I do so you can do it on your own!' And then she learnt how to do it! It also got to the stage where something new that she didn't know how to do, she'd come to me and interrupt me straight away and say, 'Jimmy, I don't know how to do this!' I'd say, 'Mum, have you tried to work it out it yourself?' She'd say, 'No, I just don't know, I just don't know. No, I've never done it before!' I'd go, 'Mum, try to work it out yourself, see if you can do it and then I'll come and show you if you can't but if every little problem you come to you just say, 'Oh, no, I can't do it, you are never going to learn because you are going to have someone coming in, doing it for you every time and that learning process isn't going to happen! .

Billy enjoys a similar background to Jimmy's, although in his case both his parents are computer literate and are habitual users of ICT and the internet. Billy has a younger brother who is also an avid ICT user. The family has several computers with the father and mother having their own laptop computer and Billy has a workstation that is modern and up-to-date. They have a broadband internet connection that is shared via a wireless network and this was setup by Billy and his father. Billy was studying for his AS levels in Spanish, RE, History and ICT. Billy also helps his mother out on the rare occasions when she need help and he feels he has become the computer expert in the family. He explains that this has happened because his family has become 'complacent' and will not try to work things out for themselves if they know he is going to solve the problem:

> **Billy:** ... I think it's the fact that they know that you are interested and that you've become like the hub of information for ICT and they see you being able to do everything and not coming across any problems or being able to solve problems... they become complacent. 'If I have a problem I'll just go to...'

Stuart also has a computer with printer, scanner, DVD player, web camera and so on but in his case there are two computers in the house: one for his parents and one shared by Stuart and his older brother. There is an ADSL connection but this is not shared at the time of the interview, nor was there a network although Stuart had recently asked Jimmy to help him build one. His family also relies on his expertise although he admits that his father tends to try things out for himself first. Unlike Jimmy and Billy, he does not seem to enjoy helping others out, which he ascribes to a lack of patience:

> **Stuart:** My situation with my parents is completely different actually. My dad is quite adventurous and he will try and do things himself and if he really can't, then he'll ask me. My mum, she really wants to learn and she'll ask me to teach her and on many occasions I've sat with her, for a few minutes, and shown her how to open her in-box and I'll lose patience because I'm not a patient person... and I'm not a teacher! I can't teach. I do, I don't teach! I lost my temper and I did it for her and let her carry on with the rest. They are willing to learn. My dad at least, tries himself. My mum is willing to learn if someone teaches her but I don't have the patience to teach!

The three friends had recently setup a 'company' dedicated to design and construct websites for others. They have managed to register as a business entity with the help of JImmy's father, a local lawyer. At the time of the interview, this still seemed to be at an embryonic stage. The idea, apparently, came from the fact that they had had a few requests from friends and acquaintances for website designs, including a request from the school's senior management. At the time of the interview, they were in the process of constructing this, although they were still at a planning stage. Stuart was studying for his AS levels in English Literature, ICT, Business Studies and RE.

The three admit to having learnt about computers quite a few years ago. They now find that the demands made by school does not allow them to 'experiment' and 'play' as much as before and their usage seems to have switched from playing and leisure to using ICT as a tool for learning and not because of any inherent interest they may have in the technology:

> **Interviewer:** How many hours a day would you say your were engaged with a computer.
> **Stuart:** Probably too many! I'd say, I'll switch the computer on when I get home at about 3.30, 4-ish... and I'll be on until at least midnight.
> **Interviewer:** Ok. What about you, Jimmy? Is it a similar thing?
> **Jimmy:** I can't say that every day is the same.
> It also depends on what homework I have. If it's a lot of History homework, I will be, but for example for something like Maths, I barely touch the computer.
> **Interviewer:** So what you are telling me already, is that most of your use is linked to school, is related to school.
> **Jimmy:** ...when I didn't have a lot of homework... on the internet, browsing, talking to people, that is when I did a lot of my learning. This was during my Year 9 period in school where I didn't have that much work but I got into the bad habit of spending 99% of my life on the computer, and that's where I did the bulk of my learning. That's where I learnt most about my hardware, about the software, about everything, really. And then, as the years went by and school started getting harder and harder you started having to put in more work, more work, more work and suddenly your use for the computer went from experimenting, it went to using, for what I'd actually learnt to do work or...

Billy also identifies a time in the past when he could spend more time playing and experimenting and explains that it was during this period that most of his learning took place. He says that he is now using these skills to help him with his school work although he admits to sometimes finding opportunities for experimentation and new challenges:

> **Billy:** Well, that's what happened with me as well. I mean, I started learning from a young age and it got... ...around Year 9, when you don't really have that much workload. It's an easy thing, when we started playing more games or that's when we started doing the web development. We started getting into

> the web-sites, we started getting into programming, we started doing all these different tools. Now it comes to a point when you are doing GCSE and AS where you haven't got time to do that, but that's.... you know, you are applying the skills you've learnt already to your work... and sometimes, you know, I still have time to learn because, you know, sometimes I don't have any work to do so I just sit down and... you know... I have a problem... like yesterday, I had a problem with my DVD drive. It didn't work and it was a problem with the firmware, it was a bit corrupt and a bit out of date and I installed a new program and it didn't let me read the CD... so I had to just go on-line, you know, download the firmware and install it and that's something I hadn't done before. I had never changed the firmware of a device...

Part of this early apprenticeship, it seems, stems from the playing of computer games, as the three say, the problems and setbacks arising out of this activity provide good learning opportunities.

When asked if games are easy to learn, Jimmy explains that 'games are games' and that they are easy to learn. Billy points out that this is because 'games themselves tell you how to play them'. They both agree that learning how to play games is made easier by the integrated 'tutorials' and 'help' afforded by the software itself. Jimmy tells the interviewer that learning about hardware and software can occur whilst playing games because of the need to resolve the inevitable problems and setbacks that arise. These have to be tackled for the game to proceed:

> **Jimmy:** The games gives you the interest to learn because you want to do the game, you want to play the game, you are excited to play the game and something is getting in the way of that enjoyment, of playing it and you have been waiting, and you've heard about the story behind the game and it sounds really good and you really want to play but then something is in the way! You want to go and solve the problem! Whereas if it was, maybe something else, and there was a problem with it, you may not be as motivated to go and solve it and learn what was wrong... because it was a game, you want to play, you have a larger desire, your desire is greater to play that game so you want to go and solve the problem.

They have all taken 'ownership' of ICT in their respective households, perhaps because nobody else may have been as interested as them at the time of the original purchase of the equipment. Jimmy, for example, seems unclear as to when he got his first computer and explains that he must have been eight or ten years old, he does remember how he established himself as the 'expert' at home:

> **Jimmy:** ... years and years ago, it was a Pentium 133 processor, it was ancient but I got hold of that, it was the whole family and none of us had ever seen a computer before and we literally sort of just turned it on and started looking around and I was always the one that was the most interested and it ended up with everyone coming and asking me, "Jimmy, how do you do this? Jimmy how do you do that?

In Billy's case, his father was the initial 'expert' because of his own interest in technology. As a young child, Billy treated it as a 'toy' as he started 'playing around' with it:

> **Billy:** It happens in my house. I got my computer when I was in Year 4 in school at around about 8 as well, you know, and I was advantaged because the computer was in my room, it was my toy to play with and that is what I did. I started playing around. I started off with PAINT, WORD, you know just started playing around, you know, the settings used to go wrong. I used to call my dad,...

As he tells the interviewer, Billy encountered problems and says that his first recourse was his father but he soon managed to establish himself as the 'expert' at home and helped out the other family members, including his father:

> **Billy:** My dad, had prior knowledge of PCs when they first came out because he used them for work with a lot of the CAD programs. He used to give me like a basic thing, at the beginning, you know, this is what you do with this, go to START program...but then I started doing it by myself. Started learning what each function of the computer did... and... you know what happens now is I've taken ownership of the computer. I mean in the house if there are any problems with IT, my brother's computer, my dad's laptop, my computer or whatever, you know I am the one who has to go and...

For Stuart, it was first an interest in games that sparked his interest in computers:

> **Stuart:** I remember getting my first computer in September of '97 – I think I was 8 years old at the time and I remember the first thing I did was playing some 2D golf game which must have seemed absolute rubbish at the time or... now it seems rubbish, at the time it was alright.

His interest was also spurred on by the way computers and users were portrayed in the media. He remembers being quite impressed by the keyboard skills of people depicted on television films and this made him want to emulate them. He tells the interviewer that he also started playing around with the machine, seeing what 'you can and can't do'. He describes his early memories of the experience:

> **Stuart:** From there I progressed, you know, you look around and you see what you can and can't do. I remember watching TV and it looked pretty cool when people could type really fast. I remember opening WORD and trying to type or just write whatever I could with my two index fingers and from there you progressed you see how far you can go.

The need for typing text relatively quickly is a factor common to all three friends as this served to motivate them to learn their keyboard skills, Stuart, in fact, seems to have viewed this almost as a personal challenge:

> **Interviewer:** So how do you type now?
> **Stuart:** Now, using all my fingers.
> **Interviewer:** All your fingers but you are quite fast? You've never gone to 'typing' lessons?
> **Stuart:** I've never gone to typing lessons but you learn the odd bit in school but that was really not much help...but you learn...

Similarly, Jimmy took an interest in learning to type. He installed software to teach him the necessary keyboarding skills with a view to becoming more proficient but soon found a 'shortcut':

> **Jimmy:** The typing for me has been quite interesting because at one point I did load a typing teacher program and it talked to you about which fingers you

> used to press each key and I did that once or twice but I never did really like that and I got used to using these two or three fingers and I used the same fingers for every button!

Jimmy recognises that it is possible to learn how to do something in an unorthodox fashion and still manage to achieve good results. Jimmy reflects:

> I've become really, really fast using the wrong... method... I've taught myself and I'm actually typing quite fast... it's not going to be as fast as a secretary that knows how to use every single finger but it is quite fast and I've got there without having to use a proper typing method or anything.

The effective inputting of text via the keyboard seems to have been a significant learning landmark for all three friends and it is Billy who provides an indication of the benefits of rapid text input:

> **Billy:** One thing that helps in your typing is CHAT programs on the internet because...
> **Stuart:** Yeah.
> **Jimmy:** Definitely.
> **Billy:** You are there and have to have a conversation and sometimes you have so much to say that you cannot afford to be a slow typer...

In their particular case, the need to use a chat program 'effectively' clearly provides the motivation for learning to type, even if this is with two fingers. The three also seem to be very aware of the disadvantages of teaching themselves in this way because of the way in which it affects their school based usage of ICT:

> **Jimmy:** Although you find that when you are used to chatting a lot, you are writing a piece of homework and suddenly, the slang, it is programmed into your brain and suddenly the slang appears in your coursework! Instead of typing in 'Y' 'O' 'U' you type 'U' and you don't realise, you need to read over it, again, to actually realise that in that sentence you've put U instead of Y O U.

The benefits, however, are apparent and as far as Jimmy and Billy are concerned, learning to type 'fast' has had an impact on the way they study and

do their school work. Jimmy explains that now he is able to type out text faster than he can write and this helps him with his note-taking for History:

> **Jimmy:** Well, I find that I use it a lot because, for example, with History it's a lot of reading books and making notes on the books that you are reading. Now, I type a lot quicker than I write so if I'm going to make notes it takes a lot less time to type it on the computer because when writing it, the limiting factor isn't my thought processes or my reading, it's the speed and the effort that it takes to actually write on paper.

Billy feels that he also benefits from using a word processor to take notes instead of writing out notes for his studies.

Whilst he tends to word-process his essays and assignments, Stuart prefers to write his notes out by hand:

> **Stuart:** I work on a different system. I do like proper pieces of homework, like you know, essays and whatnot I do on the computer. I find it easier and more presentable, in that sense but for notes, I don't know why, but I'd rather sit down and taken notes, hand written, like the old fashioned way...

One of his teachers, Stuart remarks, advised him to use the word-processor to make it easier to edit and amend notes and text passages. Stuart, however, remains reticent and only does this for Religious Studies, even though he admits to understanding the inherent advantages of word-processing his notes:

> **Stuart:** ...I just find it easier that way. Apart from Religion, which is quite new to me, you know studying philosophy and ethics. Our teacher advised us to do it on computer because throughout we are going to be finding new information on everything you are doing so you just slip it in the right order rather than adding it to the back... I'm writing notes on the computer for that subject, for convenience. Everything else I find it easier, or I prefer, writing it out, handwritten.

When asked about the equipment he has access to, he comments that his scanner is not working and this prompts the interviewer to probe further into

the strategies he employs to get around problems and setbacks with technology. Stuart says that he does not really use his scanner much and that when he does he normally asks one of his friends or relatives to scan for him. Although he claims that he is not very good with 'technical' things, he does seem to know enough to distinguish between software and hardware faults. Stuart explains that he would either take it back to the shop or call upon Jimmy. This comment prompts Jimmy to respond that he can only sort out software problems in equipment such as this. He does, however, demonstrate that he understands the principle of how a scanner works:

> **Stuart:** I could take it to the shop to get it fixed or I could ask someone like Jimmy who probably would be able to do something about it...
> **Jimmy:** The question is, is it software, like, would it be... is it a software problem where it is a question of the drivers aren't installed properly, or whatever, or is it a mechanical problem with the scanner where there is something mechanically wrong with the laser or the motor that the laser runs on...
> **Stuart:** It's actually a hardware problem...
> **Jimmy:** If it's a hardware problem then it's something I can't fix because it needs to be software...on the computer.

The interviewer asks if what they are doing could be thought of as accessing other people's minds and experiences to solve their own problems:

> **Interviewer:** (To Jimmy) Stuart would access... your 'head' essentially? Your knowledge!
> **Stuart:** Yes, definitely.
> **Interviewer:** You see, this is what I'm thinking here. I don't want to put thoughts in your head but, you see, you have a problem but you don't necessarily need to know how to solve that problem yourself...
> **Stuart:** You just need to know how to find the answer...
> **Interviewer:** ... but you need to know how to find the answer, and in your case you would ask... Jimmy, say, for example. Problem solved!
> **Stuart:** Yes.
> **Interviewer:** ...but the end result is the same, isn't it?
> **Stuart:** And from there as well, you learn as you go along, because I remember...
> **Jimmy:** Exactly!

Stuart points out that he learns by 'remembering' how a problem was solved and reminisces about his first computer game and how he learnt to install it by asking a friend over whenever he had a problem with it. He observes that now he is able to do much more with software than all those years ago:

> **Stuart:** ...every time I had a problem with it, I had to call a friend up, and it's something simple! You stick the CD in, go to the 'C' drive and hit 'Install' and whatnot...now I can do a lot more than that as far as software goes.

When asked if he learns 'by doing' he replies that he feels that he learns by watching other people do things. He also adds that experimentation and coming across things 'by fluke' forms an important part of the learning process.

Jimmy expands on this further and points out that encountering setbacks and problems are actually learning opportunities. In other words, he feels that having to work at a problem and not achieving immediate success, has provided him with good learning opportunities. He explains:

> **Jimmy:** It's all about finding a problem that's getting in the way of what you want to be able to do and because you actually want to do it, you find you have a need to go and work it out, and you go it and you work it out and you do it yourself and you learn it!

Jimmy goes over the thought processes that help to explain how he learns to do things with the technology. His comments suggest that motivation is important, even if this is simple curiosity.

The observation of someone else solving a problem or being told how to do this may not be enough for learning to take place, at least, not for Jimmy:

> **Jimmy:** I mean by trying to do it, not succeeding then asking someone and having someone else do it for you, explain to you, suddenly that slips right into your head, and then you know, and then you don't just let them do it for you, but because you've tried to do it yourself and you weren't able to, he does it for you, and then, suddenly, you find yourself asking questions. 'What are you doing?' 'When you are doing this, what ... ?' And he explains to you what he was doing, and then suddenly from him just doing it

> for you, you are learning from him because you are taking it in because you didn't know how to do it before and you were curious.

Billy also explains that the way he feels he learns is by experimentation, playing about and 'trial and error'. He understands, he says, that people cannot learn solely by having someone else tell them how to do things. His argument is that if someone knows that someone else will do something for them, then there will be no motivation to learn. The interviewer asks if this mean that people only learn what they 'have' to learn:

> **Interviewer:** What are you telling me? You don't learn anything you don't need to learn?
> **Billy:** Well, that's what... it's exactly the same situation as with Jimmy's mum, it happens with my mum as well. She asks me, 'I need you to do this', or 'How do you do that or the other...' I'm like, 'Well, it's easy, I'm sure you can do it...' But they insist on you telling them! You know, they don't try first. That is the difference between how we've learn and how they expect to learn. Well, at least in my opinion, what I think is happening is the fact that since you know, they expect you to teach them. That's not the way we learn! We learn by experience. We need to do it. No one's there to help us because our parents are not totally computer literate so, we're brought in... there was no information out there. We had to learn by ourselves!
> **Interviewer:** How did you learn?
> **Billy:** Well, really, it's just by trial and error! Go in there, you know, your computer... you have problems, you have to format it, or you know, you've had problems or you've broken it, it's completely gone to pot or something and then you've got to try to fix it...

Billy is very aware of the interdependence that exists between himself and his friends. He points out that learning from his friends is something 'we do a lot'. They tend to share their problems, especially when learning something that may be 'new' to them. In this instance they mention learning about website design, something the three of them were involved in at the time of the interview. They use their CHAT programs to communicate and type out a

query, share files and so on. The three explain that they tend to work collaboratively:

> **Billy:** We use it to transfer work, as well, you know, like for the website. If we have to send a layout, Jimmy did the layout in his house, you know, he sent it over to me. I gave him my opinions.
> **Interviewer:** So you collaborate...
> **Stuart:** All the time, yes

They are very aware of the limitations of the technology when it comes to communications and will only use it where it is convenient. The telephone or face-to-face meetings are still the preferred option, as Jimmy says:

> **Jimmy:** If it's a problem that involves a lot of communication between ourselves, like an elaborate problem, we'd end up calling each other up because it's not realistic to sit there typing over the thing. You know, I say my bit, then he says... it takes too long.

Billy provides an insight into how he perceives this collaboration functions by explaining that whatever he learns from Jimmy somehow becomes his own to pass on to others. Billy describes this as a 'web of friends' and compares it to the internet:

> **Billy:** It's like the internet, sort of thing, but with people! You have your people whom you know are good at it and each of them, like we said, specialise in a different area. Then you know if I'm particularly interested in web-design I'd be the person most likely to keep up with the technologies. The same with hardware, if Jimmy is more likely to keep up with the software... it depends what you have to buy, if you want to buy a brand new PC obviously I'd be the person most in touch with the latest technology because I've just bought it! Everyone would ask me! If I know someone has just done this, or bought this program or wants to start programming, then I'd ask them because obviously they would know and they would keep in touch.

The internet analogy is taken up by Jimmy when asked how he learned about networks. He says he asked one of his acquaintances, a computer technician, to teach him the basics. He uses the technician in much the same way as he would the internet, as another resource:

> **Jimmy:** The networking, I've got a friend that works in a lawyer's firm as a technician there. I talk to him about a lot of things and every now and again I pop into his office and have a chat... I've learnt a lot from him. If there is something I don't know, sometimes instead of looking it up, I'll ask him about it. That'll be my other form of looking up!

The internet is the main form of 'looking up' and is clearly an invaluable source of information for the three of them and, as Billy and Jimmy explain, it functions as an extension of Billy's 'web of friends':

> **Jimmy:** It's basically like having a massive encyclopaedia. You can say, as long as you have a connection to the internet, you could basically say, you know everything! You don't know everything in your head...
> **Billy:** But you have access to everything...
> **Jimmy:** You have access to learn whatever you want to learn. If you want to learn how to cook this, you'll find a page to cook that. If you want to learn to do this in mathematics, you'll find a page teaching you how to do that. So if someone asks 'Could you do this?', you could say, 'No, I can't, but give me two days and I'll come back and I'll be able to!'

They both make the point that it would be impossible for one person to keep abreast of all developments in the field and that they rely on their friend's particular interests and areas of 'expertise'. Jimmy comments on how this seems to work almost as a natural consequence of their activities:

> **Jimmy:** It's all really perfect, how it all works together. It hasn't been planned, it hasn't been arranged. No one said, 'Billy, you keep up with this!' or 'Jimmy, you keep up-to-date with this'. All of us have our own little 'vendettas' to learn as much as we can but we go in different directions...

The three friends are involved with the setting-up of the school website. They explain how this evolved as a result of their own interests. Stuart describes how he taught himself by asking Jimmy to provide him with a few useful pointers such as websites and online tutorials on the programming language used for basic web design. Billy says he taught himself in a weekend. It is significant that the roles for the school website project were

assigned 'automatically', that is to say, with each participant naturally assuming a role according to their expertise. They continue to discuss their collaboration but it is Jimmy who manages to best describe, with one word, the way they work together:

> **Interviewer:** How did that happen? Automatic...
> **Jimmy:** Automatically, which none of us were really assigned. We just saw that one of us was better at one thing and everyone kind of said, 'Well, he's better than me, he's the one that's good at this.' So someone always shone in one area of ICT and everyone just gave them that position...
> **Interviewer:** It just happened?
> **Billy:** Yes, naturally.
> **Jimmy:** Magically!

7.7 Linking the interview data to the research questions

The interviews show that the young people interviewed engage in a wide range of ICT activities and tasks. The data also demonstrates how it is difficult to define the boundaries of what constitutes an Activity System within domestic environments given that the resources drawn upon by the subject are not necessarily part of that same environment. All the subjects explain how they draw and depend on other systems of Activity according to their own developing 'protocols' and strategies for accessing help and support. This is an important feature of the ICT usage described in this study. As far as the research questions driving the investigation, the first: "What is meant by claims that young people teach themselves ICT in their homes?" can begin to be addressed by the data. It is important to juxtapose what we mean by people being by 'themselves' with the range of social interactions and artefactual resources they are able to access from their homes and to re-think whether people can ever really tackle learning 'on their own'. A far easier question to answer at this stage is the one that asks about the nature

of what young people do with ICT at home. This is summarised in table 6 below:

Creating local area networks
Communications with others (text, voice and video)
Using a word-processor
Using a spreadsheet
Designing and using databases
Using graphics packages
Building computers
Troubleshooting and repairing computer equipment (software and hardware)
Maintaining and upgrading computers (software and hardware)
Cleansing computers of viruses and other malicious software
Recovering lost or deleted files
Using the internet for research and study purposes
Using the internet for leisure purposes (music, hobby interests, exploration)
Manipulating, listening to and archiving digital music collections
Manipulating and archiving graphic data such as digital photographs
Playing games (single user and on-line multi-player)
Programming
Creating websites
Installing and uninstalling software
Experimentation and 'messing about' with software

Table 6: The scope of the activities undertaken by young people - categories gathered from interviews

The range of tasks and activities that the young people interviewed said they were undertaking, or had undertaken, requires a wide range of skills, many of them 'technical'. This may suggests that young people are constantly and dynamically, developing the necessary strategies to allow them to undertake complex and difficult activities, actions and operations. There is also evidence to suggest that these strategies will vary according to perceived needs and will be either learned or discarded, once the task is accomplished. There also seems to be an underlying awareness, expressed within the interviews, of the role of 'community' as a resource pool to be accessed as and when required.

The use of pictorial models illustrating the interactions that occur during ICT use, especially when problems and drawbacks are encountered, will enable a better appreciation of the nature and complexity of these Activity Systems. The models follow in Chapter 8 and represent data generated by the interviews and other contextual information discussed during the course of the study.

Chapter 8: An interpretation of the interview Data

8.0 The Activity System models

The Activity System 'triangles' below use data from the interviews as key nodal points. The complexity of the interactions and 'mediational' processes soon becomes apparent and this is the explanation for the double-headed arrows; interactions are two-way and one action or operation will always impinge on another. They also show how the outcomes of other people's Activity Systems are called into play as and when they are required. We also see how difficult it is to define boundaries, physical or temporal, around any single Activity System, especially so when there is access to other communities and resources on the internet. The models also provide evidence of the inherent difficulty of isolating a temporal instance that could be defined as an Activity System with a clearly defined start and a finish. The models of Activity are represented in diagrammatical form as follows:

Peter

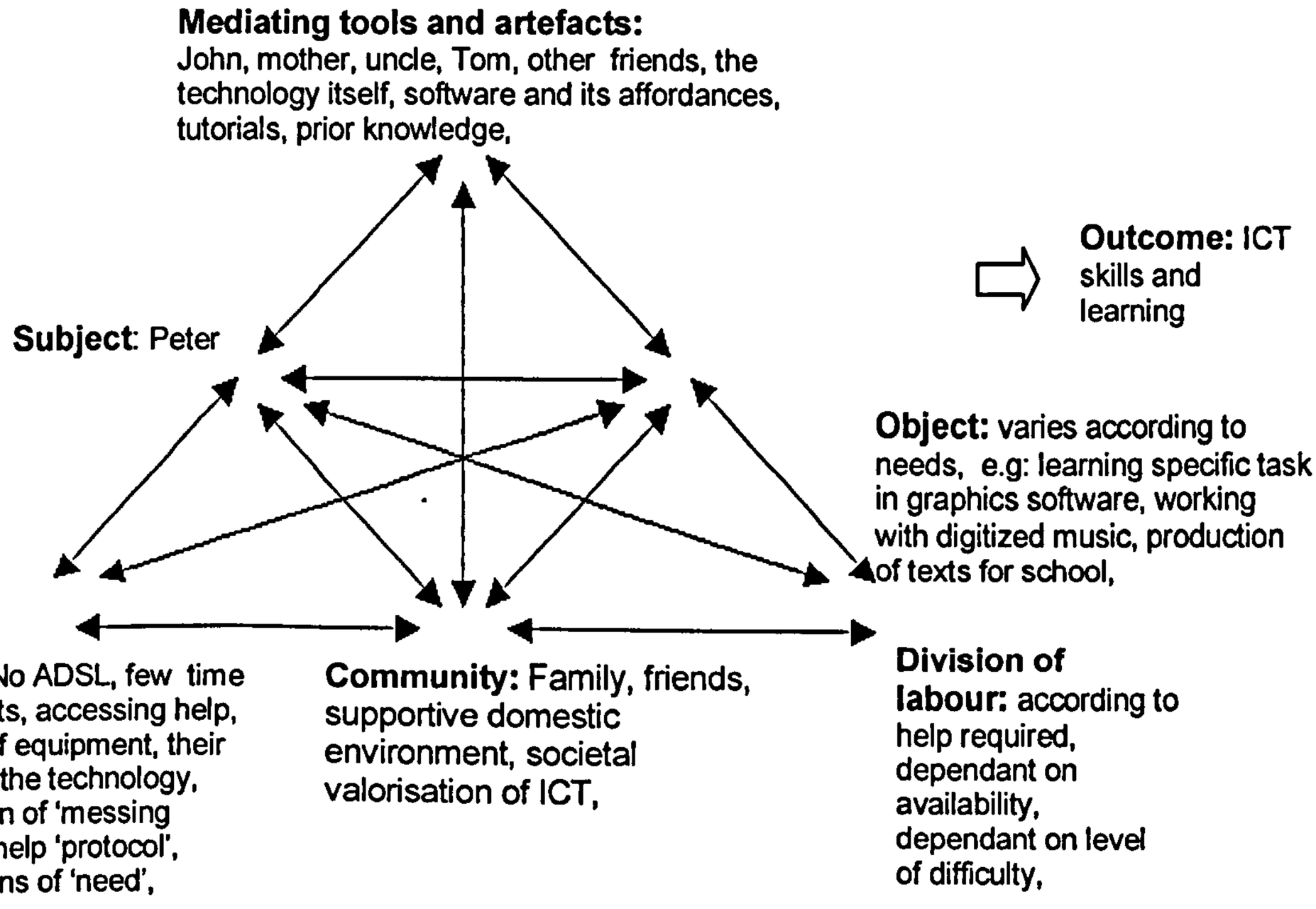


Figure 9: Peter – model of Activity System

John

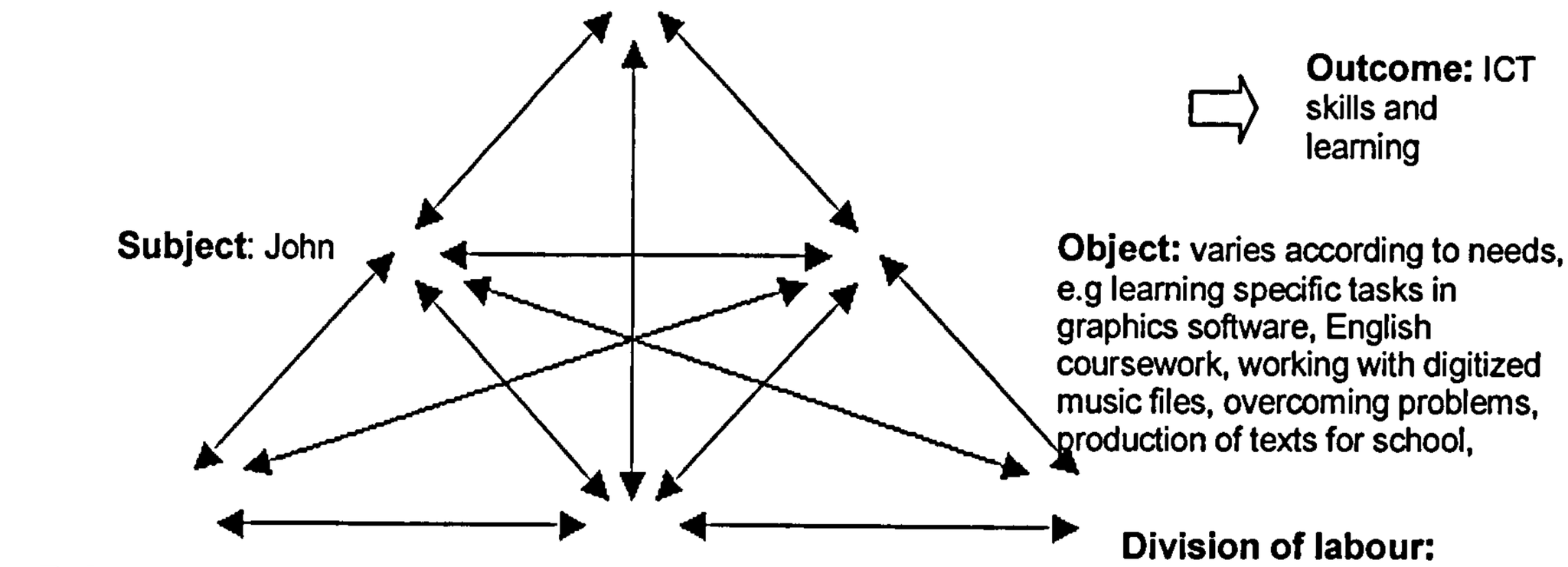


Figure 10: John – model of Activity System

Kyle

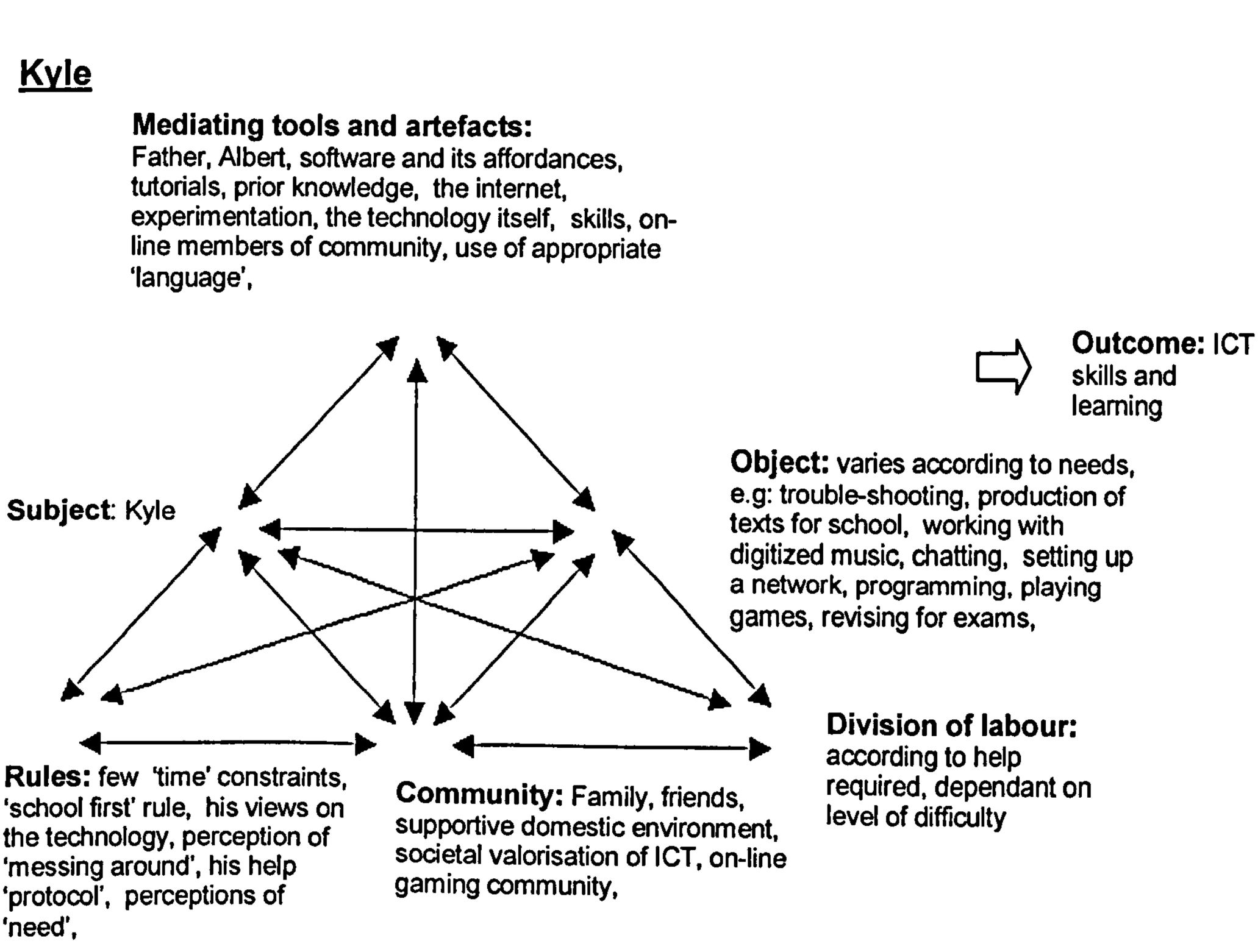


Figure 11: Kyle – model of Activity System

Jenny

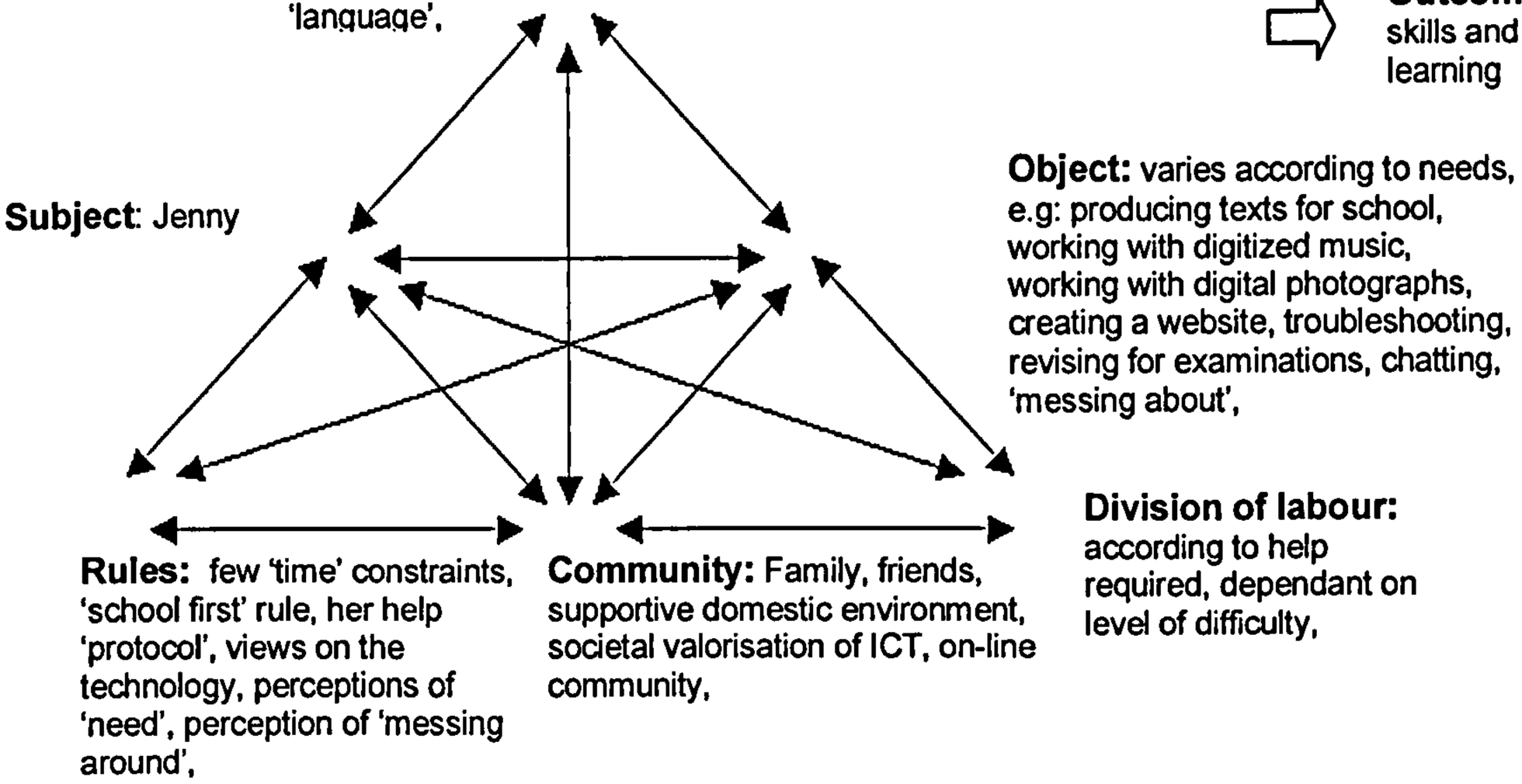


Figure 12: Jenny – model of Activity System

Mary

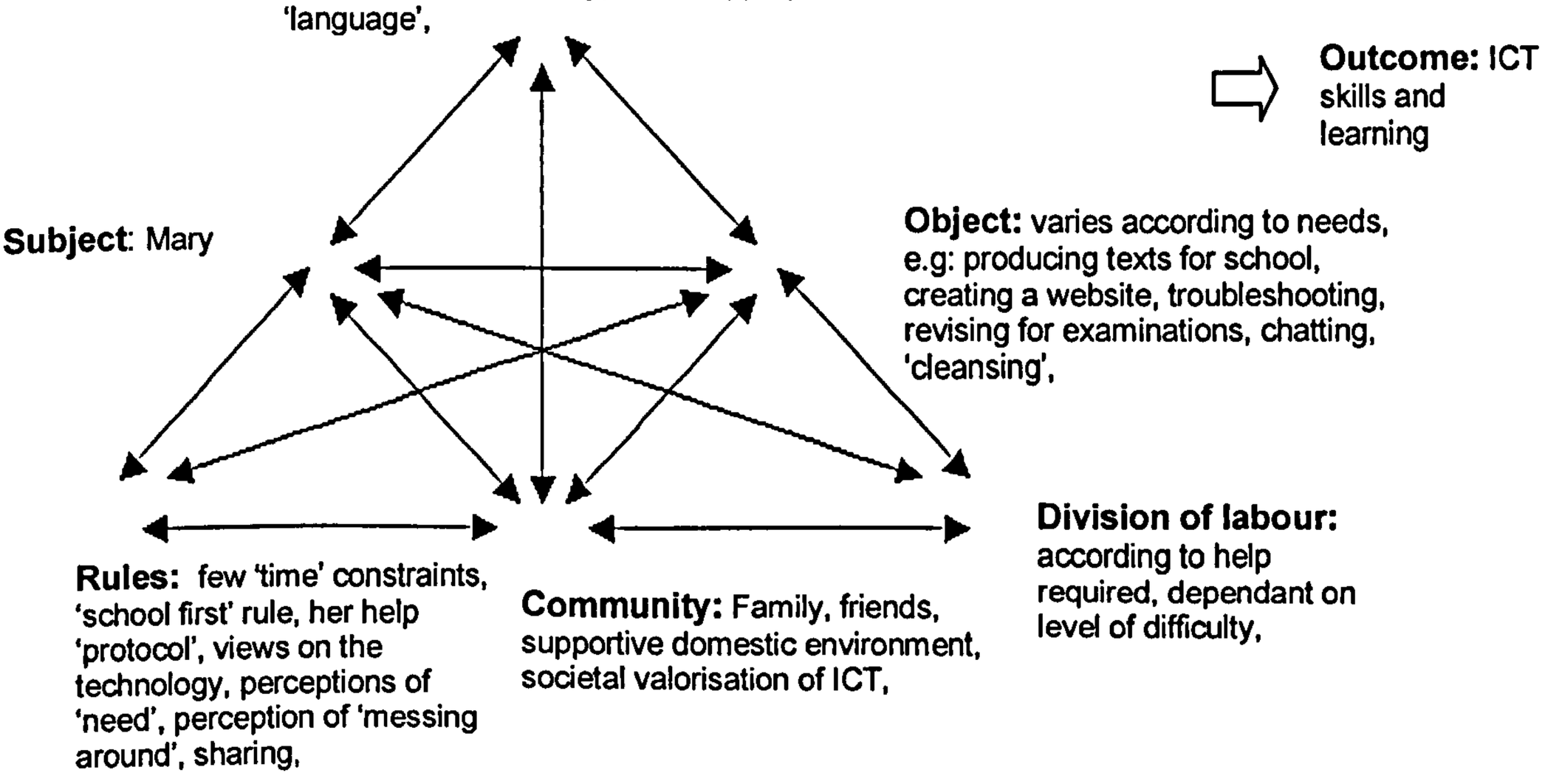


Figure 13: Mary – model of Activity System

Albert

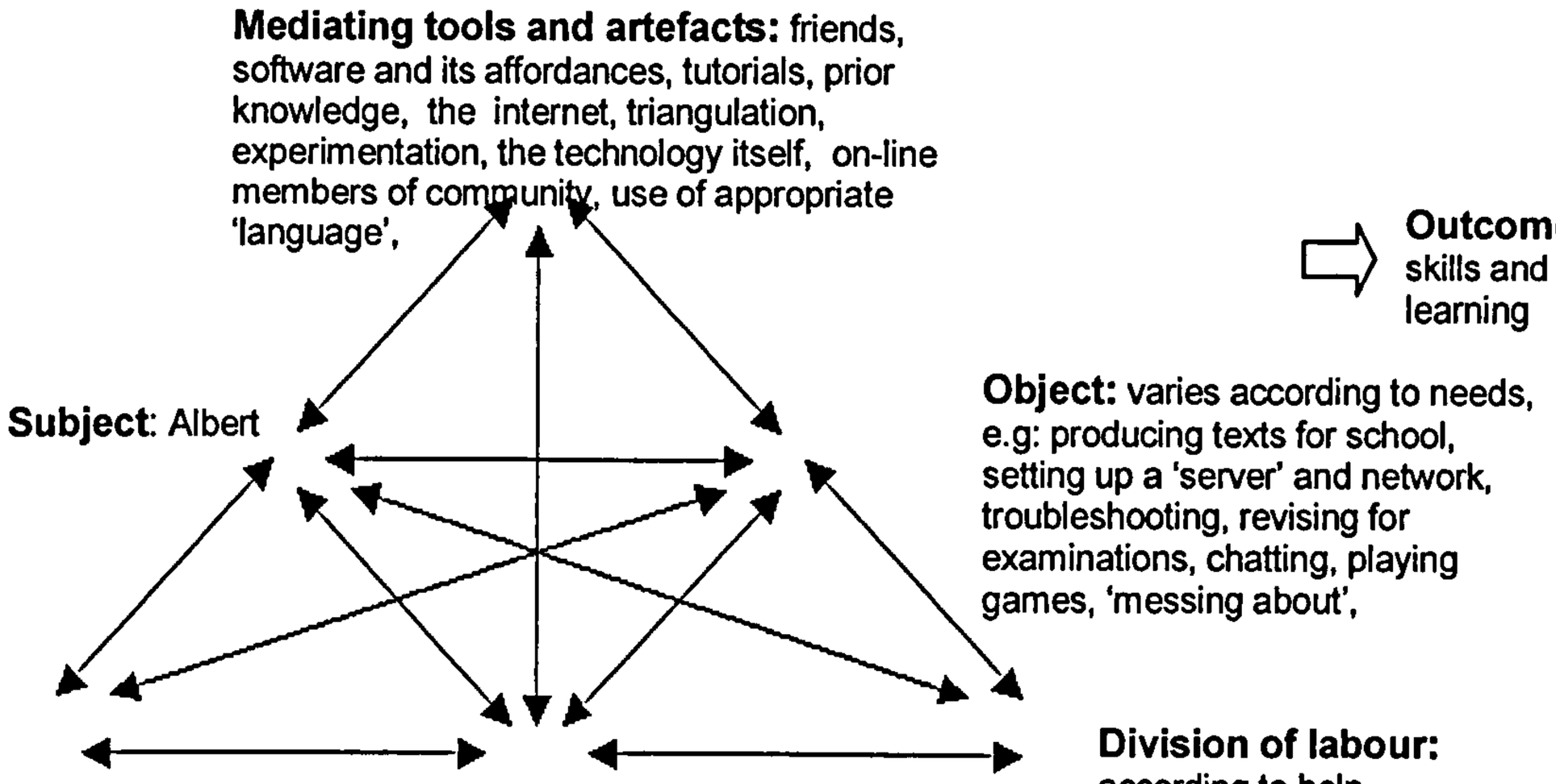


Figure 14: Albert - model of Activity System

Jimmy

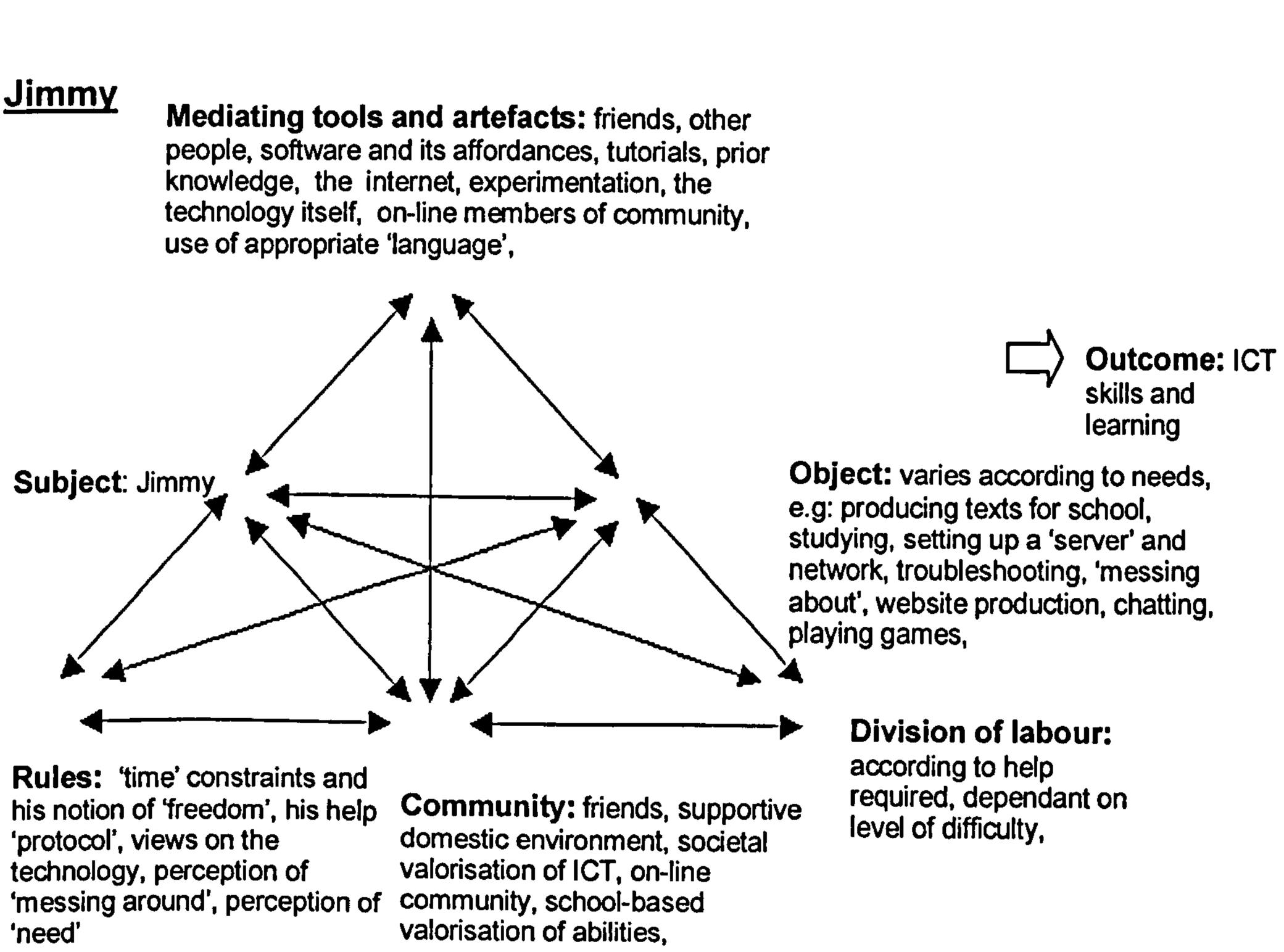
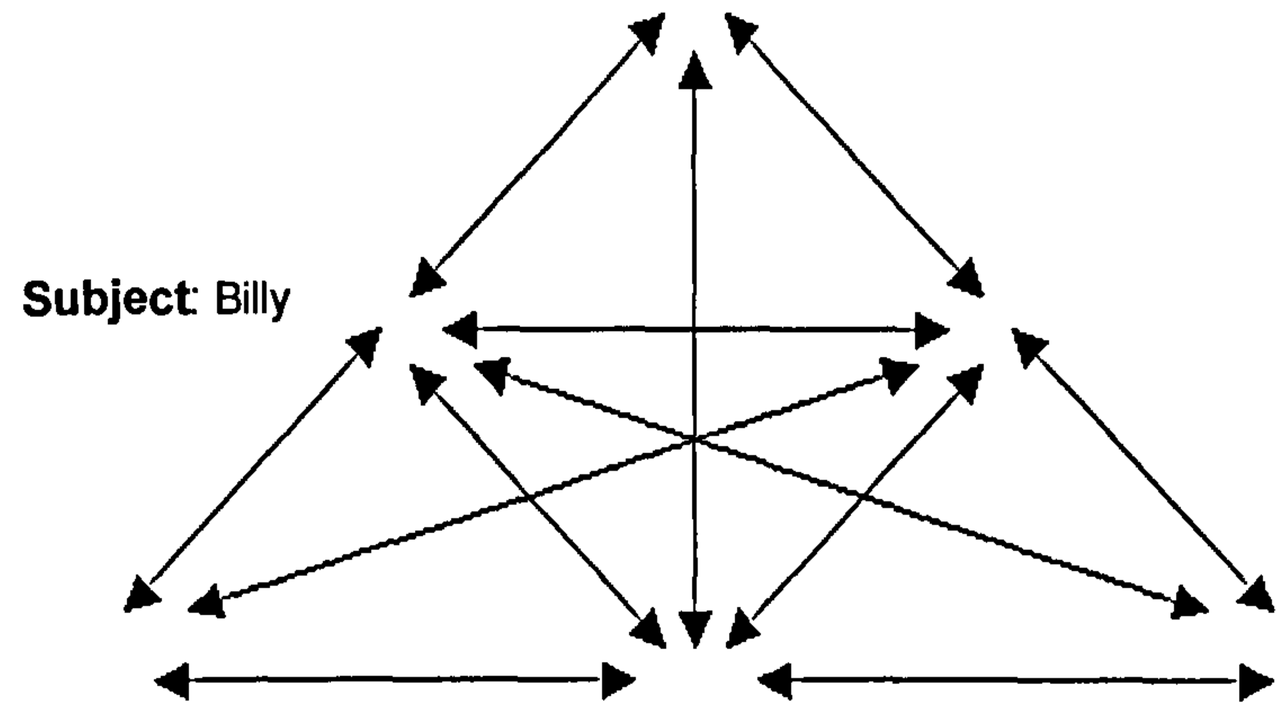


Figure 15: Jimmy - model of Activity System

Billy

Mediating tools and artefacts: his 'web' of friends, software and its affordances, tutorials, prior knowledge, the internet, experimentation, the technology itself, on-line members of community, use of appropriate 'language',



Outcome: ICT skills and learning

Subject: Billy

Object: varies according to needs, e.g: producing texts for school, setting up a 'server' and network, website production, studying, troubleshooting, chatting, playing games, 'messing about',

Rules: 'time' constraints and his notion of 'freedom', his help 'protocol', views on the technology, perceptions of 'need', perception of 'messing around',

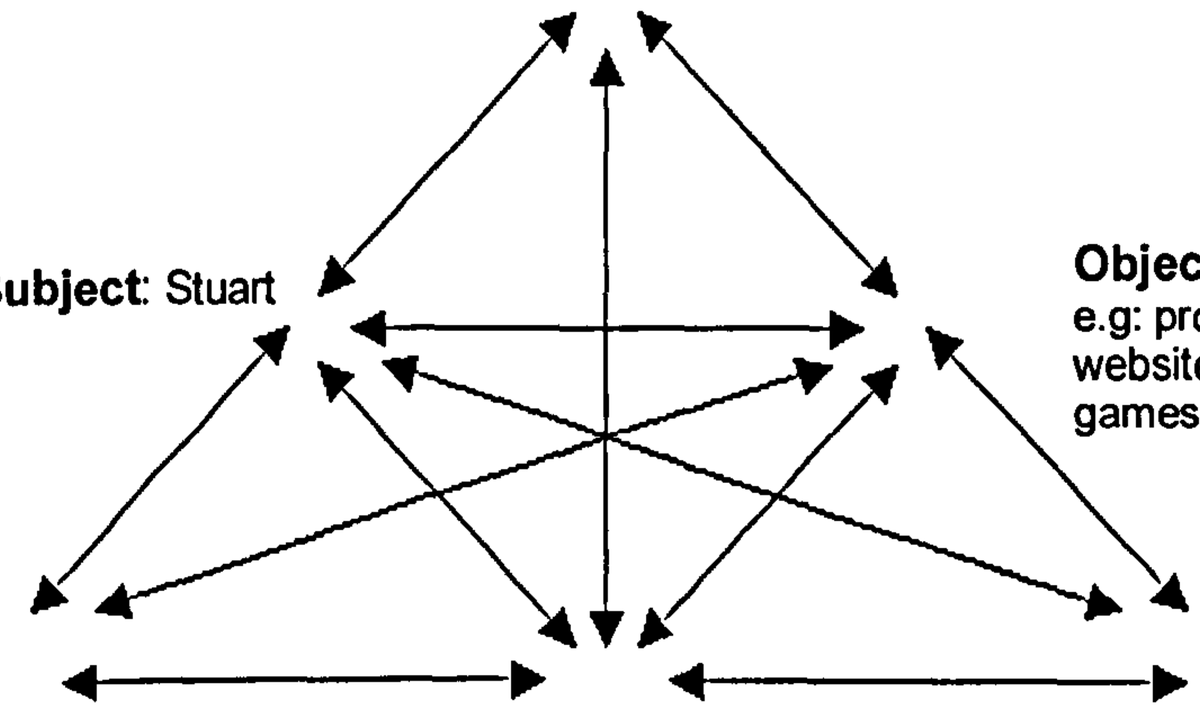
Community: friends, supportive domestic environment, societal valorisation of ICT, on-line community, school-based valorisation of abilities,

Division of labour: according to help required, dependant on level of difficulty,

Figure 16: Billy - model of Activity System

Stuart

Mediating tools and artefacts: friends, software and its affordances, tutorials, prior knowledge, the internet, experimentation and play, the technology itself, on-line members of community, use of appropriate 'language',



Outcome: ICT skills and learning

Subject: Stuart

Object: varies according to needs, e.g: producing texts for school, website production, chatting, playing games,

Rules: 'time' constraints, his help 'protocol', views on the technology, perceptions of 'need',

Community: friends, supportive domestic environment, societal valorisation of ICT, on-line community, school-based valorisation of abilities,

Division of labour: according to help required, dependant on level of difficulty,

Figure 17: Stuart - model of Activity System

8.1 The Macro-system

The modelling of the Activity Systems in this thesis tends to reflect activity at a micro-system level but the analysis of what occurs shows that, as argued elsewhere in this thesis, it is difficult to completely isolate the micro-system from the wider context in which it is embedded. These Activity Systems are dynamic and will interact with other systems from within the wider context as and when the nature of the objective dictates.

The macro-system (Bronfenbrenner, 1979) is represented by the wider environmental level inhabited by the researcher, the researched, their families, friends and peers. The general macro-system is also heavily influenced by the preoccupations, discourses and initiatives that stem from the DfES, QCA and the other British government entities from which the Gibraltar education system derives. ICT is generally seen as a positive thing at a pan-European level and this affects people's perceptions.

The activity systems examined in this study also take place within this environment and its related cultural, social and economic envelope. The influence of this specific macro-system on the learning and ICT usage that takes place in the home is evident in the interview data.

The prevalent social and cultural norms are such that academic qualifications and achievement are highly valued. ICT skills are no exception, especially in the light of the Gibraltar economy's current reliance on finance, banking, the 'on-line' betting industry and other information technology related activities. The relatively low cost of equipment and the recent lowering of rates and tariffs for broadband internet connections also means that more and more computers are being purchased for use in the home.

8.2 Objects and objectives

An object in an Activity System can be a physical or psychological tool, an idea, a concept, an objective (as in an aim) and so on. The act of driving a car, using a hammer, obtaining food or printing a picture from a computer file are all possible objects in Activity Theory (although they could also conceivably be Activity Systems in themselves). The object is the 'raw material' or the 'problem' space at which activity is directed in order to 'transform' it into a projected future state or outcome.

The data gathered as a result of the interviews is generated as a result of what occurs, primarily, at a micro-system level. It is useful here to reiterate the distinction between an overarching Activity System, per se, and the conscious 'actions' and automatic 'operations' (Kuutti,1996, pp.17-44) that co-constitute it.

The Activity System models attempt to depict the full scope of the young person's engagement with ICT in the home. Every aspect of this use (working with digital music could be an example), however, can be analysed as an Activity System in its own right, as an 'operation' if analysed as part of a larger system, or as an 'action' if some new facet is being learnt. Most of the ICT usage described appears to occur as 'operations' and 'actions' within larger Activity Systems. These systems are, by their very nature, difficult to describe accurately as they encompass a huge range of possible 'objectives' extending from producing texts for school to setting up server-based networks. The objectives are themselves driven by goals set, either because of extrinsic influences such as school, the need to help a friend or family member or more intrinsic influences such as an interest in music, programming, networks or,

quite simply, a curiosity in the technology. They include things as complex as the setting up of computer networks and programming or as simple and mundane as communicating with friends. The full range of ICT tasks that emerges from the interview data suggests that the home is a site of both intense and diverse activity.

The objects, or 'problems spaces', described in the interviews are similar to those described in other studies of ICT use in domestic environments. A common feature across all interviews is that most school assignments involve the production of texts and this has been reflected in the models. School initiated tasks tend to drive the use in the home and generate most of the 'Office' type application software used by young people. The word-processor and the spreadsheet, then, are used because of the demands of schooling, although the word-processor is by far the software application young people are most familiar with. Games play is also extremely common as well as using the technology for chatting to friends. Time is also spent simply 'messing about' with the computer, its settings and controls. The full range of tasks and activities described by the young people participating in the study has been provided in Chapter 7, table 2.

8.3 The role of the Community

A community is, essentially, the social and cultural environment within which the ICT activity unfolds and it provides a pool of resources from which the subject of this activity can draw. The subject's immediate community is the domestic environment which includes siblings, parents or anyone else sharing that environment. This may then be extended outside the home to an outer circle of close friends or relatives or even 'friends of friends' and so on.

The term 'Communities of Practice' (Lave and Wenger, 1991) usually refers to participants of Activity Systems within the relative confines of the workplace (ibid.) where the sharing of a common language, practices, rituals and conventions have to be passed on to those aspiring to admission into the community. The term usually refers to more formalised communities such as those constituted by trades and professions although there are situations where it would seem appropriate to apply term to activity in the domestic environment even if there is no conscious intentionality of 'admission'. Mary, Jimmy, John and Peter, for example, all seem to have recourse to the more formal support structure of members of a 'professional' community of practice and seem to make use of this resource from time to time. Jimmy admits he tends to ask an acquaintance, a professional technician, whenever he perceives he has an insurmountable problem. Peter and John have recourse to their uncle who also happens to be a computer professional. Mary has her father, who also happens to works in the field. Subjects are thus able to access resources from a formal community of practice without actually being part of it.

Others, such as Kyle, make use of less formal communities of practice. These are communities constituted by people bound together by common interests and understandings in, say, games technology. He also relies on Albert or uses his father for support. Only Albert seems to be self-sufficient in terms of asking people in his immediate environment for help and says that he tends to learn to overcome problems by accessing other, more remote, resources. The internet, of course, as a resource for help and support, is itself an amalgam of different communities of practice both formal and informal.

The 'community' in the Activity Systems explored in this study, however, is seen to function mostly at micro- and meso-system level. The people involved are relatively accessible and form part of the subject's milieu. At a micro-system level, this community is made up of friends and family within the domestic environment although the advent of the internet means that the reach of the communities to which the subject belongs has been extended in such a way as to make any attempt at the definition of boundaries quite problematic.

The wider social context, the macro-system, is also seen to exert a significant influence, permeating, as it does, the general 'public' attitude towards ICT and technology. Activities occurring at a macro-system level are generally conducive to the fostering of positive attitudes towards ICT on a community-wide basis, as highlighted in the literature review and earlier sections of the thesis. Computer ownership is perceived as an important factor affecting young people's success in the school system and therefore, their working life. This positive societal valorisation of ICT is reflected in the community nodes of the models (figures 9 to 17) and in turn fosters positive attitudes towards ICT in general. This effect also serves to mediate the application of some of the parental rules and norms mediating ICT use. All parents are perceived to be extremely supportive of their children and the young people acknowledge this perception in their interviews. The unproblematic purchase of equipment, the contracting of broadband internet services and the relatively unrestricted access to equipment and the internet, for example, seem to point to this.

An informal community formed by a group of friends sharing knowledge about games or building their own computers will be different to a more formal community of practice set up to transmit a body of knowledge, rules and norms, support and guidance to those wishing to become part of that community but both are communities of practice, nevertheless. The sharing of practice and ideas, whether by professional groups or young people using ICT, involve complex social and cultural relationships and these are seen to ensue whenever a group of people share common practices and aim to achieve common understandings about the nature of a common activity.

8.4 Rules and Norms

The relationship between the subject and community is mediated by rules and norms. These are "norms and sanctions that specify and regulate the expected correct procedures and acceptable interactions" (Cole and Engeström, 1993, p.7) and may be explicit or implicit and in the form of norms, conventions and social relations within that particular community. The existence of these rules and norms are evident in the interview data although the subjects may not necessarily be totally conscious of their significance. The data suggest that rules and norms may be generated, applied and adhered to, by the subject him- or herself, by the immediate community or as a result of the subject's relationships and interactions with the wider community.

Rules and norms affect the use of tools and artefacts, the interactions with the community, the way the community perceives the use of tools and artefacts and the decisions the subject makes about accessing help and support. The rules and norms in the domestic environment clearly affect the way ICT is used. An example of this is clearly evident in the cases where

parents did not agree to providing a broadband connection and this restricted the use of the internet and the activities that depend on this.

One common perception on the part of the interviewees is that there are few restrictions imposed by parents, in respect of time spent at their computers. This constitutes an absence of rules, yet this could still be considered to be a 'norm' within a particular household. All subjects felt, however, that they should finish school work before using their computers unless the computer or the internet was needed to undertake school work. Their notion of somehow being 'free' to do what they liked (whether real or imagined remains unimportant) with their computer equipment is something that permeates the interviews, with no one really giving the impression that there were any real restrictions imposed by domestic rules or norms.

The amount of time those interviewed are willing to invest in ICT activities is a common theme running through all the conversations. Peter and John, for example, tend to limit the amount of time they are willing to spend on overcoming problems of a technical nature and will quickly ask someone else for help. They will therefore not use their computers for games given their perception of the state of the technology and its 'instability'. Mary, Jenny and Stuart also limit the time they spend troubleshooting, preferring someone else to take this on if it gets too complicated. Kyle, Albert, Billy and Jimmy, on the other hand, will spend as much time as it takes in order to overcome problems of a technical nature and do not have any rules about the time they are willing to spend sorting out problems. All of them admit to spending long periods of time, on a daily basis, at their computers and (with the exception of Peter and John) on the internet.

The subjects all admit to 'experimenting', 'playing' and 'messing about' with software and settings, especially if it is to learn about some new feature or facility they require. The amount of time they spend on this sort of experimentation varies from individual to individual and is affected by the perception that is had about what it means to 'mess about' , 'experiment' or play with computers and related equipment and whether or not an individual is willing to devote the necessary time. An interest and a curiosity about the technology, for example, will possibly make an individual more likely to use a trial and error approach and experimentation.

Confidence is possibly a factor, as well, given that no one asked actually said they were worried about breaking or damaging anything in the process. This gives rise to certain rules and norms governing how and when they access help and support either from the community 'pool' or other extrinsic resources. These same rules and norms also mediate the division of labour across activities and tasks in the home. Peter and John, for example, use their mother's expertise to help them when their problems are of a more technical nature. They also have recourse to a group of friends whenever their mother cannot help them or is not available. The nature of the problem usually dictates how they access help and support. They explain that, as a norm, they will attempt to learn how to use a software application by themselves or using each other. Their mother, in turn, accesses her brother-in-law, the twins' uncle, when she is not able to overcome technical setbacks. In this way, subjects build a set of protocols that guide they way they access help and assistance. They also point to 'experimentation' and an 'interest' in computers and ICT as a vital prerequisite for learning about ICT, especially when it comes to the

more technical issues. They point out that not all young people are the same when it comes to technology and feel that there are key differences between their friends and themselves and how they view technology.

Kyle asks his father in the first instance when it comes to technical problems but will try to sort out software and general usage setbacks by trial and error and experimentation. When his father cannot help or is not available, he will ask Albert for help. Jimmy accesses Billy if he finds he cannot solve the problem himself whilst Stuart admits to Jimmy usually being his first recourse when it comes to technical problems. Jimmy, Billy and Stuart explain that because of pressure from school, they now tend to use ICT as a tool rather than as something they are inherently interested in.

Stuart explains that because of this he does not have a lot of time to spend trying to sort out problems or work around setbacks. This is also something that both Jenny and Mary point to. The time they spend over something will depend on their needs and whether they feel it is worthwhile investing this time. Jenny, Mary, Peter and John admit that although they know what to do in almost all cases, such as deleting all their files and reinstalling the operating system, there are times when they feel they do not have to do it themselves and will therefore ask someone else to solve the problem. In other words, they will do only what they feel they have to do and will learn only what they feel they have to learn. This obviously impacts on the subsequent 'division of labour' for any given ICT activity they are involved in within the home.

8.5 Mediating Tools and Artefacts

The interview data suggest that the outcomes of other people's Activity Systems are used as mediating 'tools and artefacts' by the subjects of this study. These interactions between different Activity Systems are reflected in the systems modelled in figures 9 to 17. Where the 'Mediating Tools and Artefacts' nodes in these models indicate that other people are used to mediate Activity, what is really meant is that the outcomes of other people's Activities are used as a resource for undertaking Activity. All young people interviewed provide examples of how they access the outcomes of other Activity Systems whether these be family, friends or an online internet community.

Peter, for example, uses John to teach him the use of the graphics programme. John has interacted with the software as part of his own Activity System and as a result has gained more familiarity with it than Peter. Peter then accesses the outcome, in this case, John's relatively skilled use of specialised software, to help him gain a more complete understanding. Both also access the outcome of their mother's ICT usage whenever they require assistance of the type they may think her capable of providing. Their mother will also access her brother-in-law's outcomes and so on. The passage of time has also allowed the twins to formulate certain rules and norms about when she should be asked to help and when they have to access other outcomes of other Activity Systems. Access to these outcomes depends on the extent of the community they are embedded in, essentially, this will depend on the number of people they know or are able to ask. Clearly, this impacts on the way the division of labour occurs for any Activity System or subsystem thereof.

People are not the sole means by which the notion of mediating tools and artefacts manifest itself in the interview data. The notion of 'software and its affordances' is also grouped within the tools and artefacts node in the individual Activity Models shown in figures 9 to 17. The affordances of the software itself are clearly perceived to be grasped by the young people and it is evident in the actions and activities they describe, especially when experimenting and using a trial and error or 'messing about' approach to learning.

The properties of some software packages are used by young people to facilitate their ICT use in several ways. The inclusion of tutorials in software applications is a common feature and the young people say that they tend to utilise it when they come across problems and setbacks when using certain software packages such as games and 'office' software. In this way, the learning process would be to be self-sustaining in as much as the technology itself offers mechanisms by which users are able to gain the required support.

The design of the software itself is also used by young people when attempting to overcome problems or they encounter some type of setback. John, for example, explains that it is this that helps to give him the confidence to experiment and 'click' on everything when experimenting and trying to overcome problems. Most proprietary software packages have a uniform set of controls and buttons and also tend to share common user interfaces and it is this design feature that facilitates usage. Prior knowledge, acquired through previous use of other similarly laid out software packages, therefore helps with subsequent experimentation and playful interaction with new packages and applications. Kyle and Jimmy, for example, point out that if software is 'user

friendly' then this makes learning to use it all the easier and Jenny comments that it is precisely the familiarity offered by 'common' layouts and designs that encourages experimentation when trying to overcome setbacks or learn new features. It is significant that Jimmy, referring to the overall concept of computer interface design, says that what makes computer use so 'easy' is that 'everything is explained'. Everything, as far as he is concerned, is laid out with an underlying uniformity and logic and it is this that helps users navigate the interface. Affordances are also relevant on a wider contextual level given that the domestic environments within which these young people are embedded, provide the social and cultural affordances necessary for their ICT use.

Prior knowledge and past experiences over time also provides young people with an appropriate ICT related vocabulary which they all clearly share. This seems to help facilitate shared understandings of common problems and setbacks they may come across in their day to day use and obviously makes communication less difficult. The young people interviewed, in fact, all demonstrated relatively advanced 'technical' vocabularies when they were discussing their ICT use in the home. Even the youngest two subjects interviewed, Jenny and Mary, showed that they had an understanding of what many of the technical terms used in the interview meant. This is suggestive of the notion of Lave and Wenger's (Lave and Wenger, 1991) 'community of practice' where the learner demonstrates a concern with identity, language and learning to act and improvise in ways that make sense in that particular community.

The resources available on the internet are also used to help solve problems and setbacks. Again, this help comes in various formats, either as text and graphical tutorials or by providing access to other people and the outcomes of their Activities. This, effectively, widens the community pool of resources that the user has access to and facilitates problem solving and the advancing of ICT skills. The rapid rise in the use of 'social software' that enable instant messaging and online communications also seems to provide young people with a resource for accessing help and support from peers. Apart from social reasons, young people also talk about computer and internet related problems and how to solve them.

All those interviewed indicate at some point in their interaction with the interviewer that they will go on the internet in order to 'find something out'. Even Peter and John who have limited connectivity explain that they use the internet help them with, for example, guitar playing or simply to 'find out how'. John, in fact, points out that if 'knowledge' is not available within the family then he will access the internet because 'someone else has figured it out and will tell you how'. Access to other people over the internet is provided by communications software, a proprietary package from a well-known software maker that seems to be ubiquitous. Kyle uses this to revise for his examinations with Albert and Jenny has explained how she used the internet to search for ways of overcoming problems with her passwords. This use of the internet is not unproblematic and Jenny indicates that she spends a lot of time trying to find the right type of information for her needs. It is Albert that points out to having some sort of technique for overcoming problems of accuracy on the internet. This he does by reading from more than one internet

source and somehow 'triangulating' information. It is ironic, perhaps, that the use of the internet for communication other than speech clearly involves substantial amounts of reading and interaction with texts, yet those interviewed rarely, if ever, admit to using paper-based text books or manuals to advance their ICT skills.

Chapter 9: Conclusion

9.0 The research questions revisited

The main concern of this study has been to examine the learning of Information and Communication Technology (ICT) skills by young people. A review of the primary research questions, perhaps, will serve to refocus on the original intentions of the thesis. The primary research questions addressed in this study are:

1. "What is meant by claims that 'young people teach themselves ICT in their homes?
2. "How do they learn?"
3. "How do we find out?"

The focus of the study did not really change as it developed except that the third question rose to the fore and evolved into a key research interest as the study progressed. Other corollary questions also arose and these helped to guide thinking about the enterprise. These 'guiding' questions were:

a) "What do young people actually do with ICT in the home?"
b) "Is home-based ICT different to school-based ICT and, if so, why?
c) Is there anything about the home environment that is conducive to learning about ICT and its use?
d) Is there anything about the nature of the ICT tools used that help or hinder learning?
e) Can we apply what we learn to the school environment?

We are left in little doubt as to the veracity of the claims made in the literature about young people teaching themselves ICT at home. The notion

of 'learning by themselves', however, warrants a degree of unpicking and this is what this study undertakes to do. The interviews serve to support the argument that learners are never really 'on their own' but are instead part of a bigger interdependent whole; an ecological totality.

The use of Activity Theory sheds light on the interactions, contexts and learning opportunities afforded by the home environment and these have been explored by examining the nature of the Activity Systems (Engeström, 1987; Cole and Engeström, 1993; Cole, 1996; Kuutti, 1996) arising out of this engagement with technology. The study is as much about the exploration of home ICT use as it is about the exploratory tools themselves; it is also an experiment in the practical application of Activity Theory.

The literature review shows that the adoption and implementation of ICT in education may be seen as the result of a kind of 'technological determinism'; a belief that technological developments must somehow be regarded as autonomous systems ultimately permeating all aspects of society. This has been described by Facer et al. (2001, p.92) as an 'an uncontrovertible orthodoxy' in which the purported social transformation is a 'unique model' to which all societies should somehow aspire to, or conform. The irony is that this seems to be borne out by the fact that technology has penetrated most aspects of human activity, from interpersonal communication to having become a yardstick, in technological terms, for 'quality of life'. This also means that the discourses that surround ICT and its related technologies are generally positive and supportive of its use by young people in the home. This is certainly the case in Gibraltar, where home ICT and internet penetration is extremely high. This has a lot to

do with the ecological and contextual considerations that may be, arguably, peculiar to Gibraltar and points to the fact that the necessary social and cultural affordances have to exist within the home environment. Given that social interaction provides a major resource-pool for learning about ICT in the home, the properties of the environment, both at micro- and macro-levels, have to be ones which permit and encourage these social interactions. In other words, the affordances and properties of the wider context must also facilitate the use of ICT in the home.

Gibraltar is fortunate to be a relatively affluent community with generally positive socio-economic factor conducive to parents being very supportive of their children, especially where it comes to the purchase of computer equipment, software and internet connections. The relatively low cost of hardware in the territory and, especially, in the immediate Spanish hinterland, also means that equipment is generally accessible to most families.

The fact that Gibraltar remains a British Overseas Territory, and its Education System mirrors that of England and Wales coupled with an extremely high level of exposure to British media and press, means that current educational and technological initiatives and discourses led by the DfES will always infiltrate and influence the local context. Although the expectations and the 'uncontrovertible orthodoxy' remain very much the same as in England and Wales, the fact of the matter is that the relative investment into ICT in schools has not been even remotely comparable. Similarly, the drive for school ICT, although a National Curriculum requirement, has not quite been afforded the same impetus as in England and Wales, even if the

discourses have been the same. The current practice of 'wait and see' in respect of educational developments in England and Wales means that Gibraltar is able to digest the ramifications and consequences before they are implemented locally. Mainly for this reason, Gibraltar schools are not equipped in the same way or enjoy the same ICT infrastructures as their counterparts in England and Wales. Instead, the site for ICT learning has relocated to the domestic environment through, admittedly, a natural evolutionary process rather because of any conscious efforts or policy decisions. The expectations that have evolved as a result of this process are that parents invariably buy computers for their children when they are of school age. As a result of these expectations, local government has come to encourage purchase by preferential treatment when it comes to import duty, as explained in a previous section.

9.1 How do young people learn about ICT in the home?

The present state of the technology itself is conducive to learning the necessary 'exotic' skills (Downes, 1999) to operate ICT equipment and software. Lave and Wenger (1991, p.103) observe that the transparency of a tool is an important factor in learning to use it. The PC (IBM compatible Personal Computer) is definitely not an unproblematic, transparent tool, as pointed out in Chapter 2. It is precisely the problems, setbacks, dissonances and contradictions that plague computer users that seem to provide the ICT learning opportunities in the home. Unproblematic, transparent use of a tool or artefact does not lead to new learning about that particular tool or artefact, it simply leads to more of the same thing. Contradictions and dissonances, arising, either out of day-to-day usage or out of the need to do something new,

seem to trigger and initiate the web of social interactions, experimentation and, 'trial and error' processes that lead to the desired outcome. The data from the interviews suggests that sometimes this will result in learning. The act of 'doing', however, does not imply that what is 'done' has been necessarily learnt by the subject. Doing something, especially in a collaborative mode, will mean that some tasks will be shared out and some will be undertaken by the subject of the Activity System.

The subjects all explain how they overcome these setbacks and problems in order to continue with their original tasks and operations as they participate in the overall Activity System. Actions turn into automatic operations as they are subsumed and contradictions and dissonances are overcome. The importance of the free and unrestricted access of the learner to others in their milieu should not be underestimated and this is a feature common to all those interviewed. This may be made easier by the relative size of the community and the 'village' type mentality that exists when it comes to contacting 'strangers'; the fact that everybody knows each other is undoubtedly a facilitator. Parents would certainly know their children's friends and families and be familiar with those whom their children contact for help or support.

The discussions with the participants of the study suggest that they will not learn anything there is no need for. Learning, if we take learning to be internalising 'actions' and turning them into automatic 'operations', does not take place where there is no motivation, or a perceived need. Obviously then, their own perception of what these 'needs' are will affect what they learn. Simply knowing how to access help and support whenever there is a problem, does not, of course, imply that there will be learning. Access to a

large or 'expert' community resource pool may actually have the opposite effect: if someone else can solve a problem for the subject, then the subject may feel that there is no need for him or her to learn how to solve that problem; this was evident in the interviews, especially where the solutions to problems were perceived to be extremely complex or of a highly technical nature by the subject. The subject, through the use of the outcomes of other Activity Systems provided by the community resource pool, is able to ensure that his or her own Activity System can continue. This, to reiterate, does not necessarily mean that every single aspect has been 'learnt'.

Willingness to participate and become part of the community-pool is a key element to learning here and points to the social 'situated-ness' of learning (Lave and Wenger, 1991, p. 29). If learning is to be seen as situated in social participation then 'willingness' and a 'need' to participate will be vital. A person's intentions to learn are configured through the process of becoming a full participant in this socio-cultural practice. Some of those interviewed stated they did not really 'need' or 'want' to know how to perform certain of the more technical tasks or troubleshooting when they had someone else to do that for them, the end result is that they do not learn to do these things. Significantly, this seems to be a matter of choice, as all of those asked explained that, if they ever felt they needed to learn something then they would do so. Learning in these circumstances, then, would seem to involve interest-specific and needs-led processes; this presents immediate problems if, as current thinking advocates (Owen, Grant et al, 2006; Buckingham, 2005; Sefton-Green, 2004), we were to attempt to apply this to a traditional school environment. The present structure of the National Curriculum and the present

programmes of study would present important stumbling blocks given that requirements dictated by the National Curriculum, as it currently stands, will rarely coincide with young people's interests or the way they engage with the new technologies.

The conversations highlight the importance of play and experimentation as a key element in the acquisition of ICT skills. This also points to the notion of 'time' as an important corollary element. The home environment obviously affords young people the time to experiment and use 'trial and error' approaches to learning. All experimentation seems to be related to learning either some new feature of a particular software application or there has been some setback or contradiction and new conscious 'actions' have to be turned into unconscious 'operations'. 'Messing about' and 'clicking on everything' seem to be exploratory strategies used by all those interviewed, at some stage or other in their engagement with ICT. This would seem to be an extraordinarily powerful tool in the pool of resources available to young people. What they are really using is the history of the Activity, and what had transpired before, in order to proceed with the present. They will use the familiarity of the 'known' to lead them into the 'unknown' in order to learn something new. In this respect, confidence is important given that all of them say they were not really too concerned 'breaking' things or of being reprimanded for spending too much time at their computers. Risk-taking, therefore, seems to be very much part of this 'trial and error' approach to finding out; the confidence that young people gain is equally important.

To summarise, then, the key features of learning ICT in the domestic environments, for this particular group of young people at least, are:

Extensive social and 'artefactual' resources are usually available and accessible
The environment is supportive and technologically 'rich'
Time is allowed for exploration; playful interaction and the overcoming of dissonances and contradictions
Young person chooses activity
Risks are taken and mistakes are not penalised
Learning is interest specific and on a 'need to know' basis

Table 7: Key features of Learning ICT in the home

9.2 The limitations of this study

The first limitation is that the subjects of this study all come from similar backgrounds in terms of parental support when it comes to schooling in general and ICT in particular. At least one parent of each subject was an ICT user or was trying to become more adept, that is to say, they were also learners. This background obviously offers scenarios where ICT and schooling is valued and there were no immediate questions arising in relation to a 'digital divide'; all young people were extremely well-off when it came to ICT equipment and their lives unfold within what could be described as a technologically-rich environment. This study, therefore, does not aim to generalise or in any way imply that all young people learn in the same way; only that some do. The subjects interviewed are far too few in number for any such attempt and, in any case, this is not what was proposed from the onset.

An important limitation is also that the interpretation of learning used for the purposes of this thesis ignores the neurological aspects of learning that occur within an individual's head and is conflated with 'notions of 'doing'. A

major assumption in this thesis is therefore that the act of 'doing' something implies that it has been, or is in the process of being, learnt. In Activity Theory terms, this is taken to mean that doing things automatically, that is, as 'operations' also implies that the necessary learning has occurred or is occurring. Learning, then, is seen as being able to 'do' something and being able to transform an 'object' into an 'outcome'.

A significant aspect of Activity Theory is that it has never been used for the analysis of activities within the home, only relatively 'public' places and institutions such as workplaces, schools, Police Stations or Primary Healthcare Centres that somehow seem to be more open to scrutiny, arguably, than domestic settings. The Activities analysed in these contexts are inherently different to those occurring in domestic contexts given that the opportunities for trial and error and experimentation, for example, would be more limited.

One particular problem encountered was that it became difficult to concentrate on any one task or activity when it came to examining home-based ICT usage, given its nature. Some of the activities described in the interviews are analysed more in terms of 'Actions' and 'Operations' (Kuutti (1996, pp.17-44) rather than as full Activity systems being developed over long periods of time. This is because the analysis of an Activity System may well require a variety of techniques, rather than just interviewing, for example, as Christiansen (1996, p. 179, citing Vygotsky, 1978 and Scribner, 1985) suggests, perhaps a more "longitudinal ethnographic observation, interviews, and discussion in real life settings, supplemented by experiments." The modelling of the Activity Systems arising from the interview data tends to

reflect activity at a micro-system level although as the subsequent analysis shows, it is difficult if not impossible to completely isolate the micro-system from the wider macro-system in which it is embedded.

A more 'ethnographic' involvement with the subjects would have, undoubtedly, provided different insights into young people's computer use in the home. This approach, however, was discarded, given the potential problems associated with gaining access to young people's homes and bedrooms and invading their privacy, over a relatively long period of time. A great deal of information was gleaned from merely talking to parents and the young people themselves, in informal situations, that is, when they were not being recorded and notes were not being taken about what they were saying. The use of monitoring software such as that used in Kerawalla and Crook (2002) for example, was also considered as this would provide a record of all computer usage in which the software is installed. This approach would have possibly helped produce a more complete record of ICT usage in the home but it was discarded on the grounds that it constituted 'spying' and an insidious invasion of privacy, even with consent. In fact, the generic name for this sort of software is "Spyware" and would have been immediately blocked or deactivated by any anti-virus or related security programs installed in the young person's computer.

9.3 The strengths and contributions of the study

In his preface to *The Network Society: A Cross-Cultural Perspective* , Castells (2004) explains that there are different theoretical perspectives in his book because 'each author has built the results of his or her research on his or her own conceptual system'. Similarly, this study is built on the

researcher's own 'conceptual system' and this gives rise to inevitable shortcomings. If we remain fully cognizant of this reality, however, it becomes a strength and not a limitation. Implicit in Cultural Historical Activity Theory is an understanding that people operate within the temporal, physical and intellectual constraints afforded by their culture and environment. (Cole and Engeström, 1993). The relationship between a human agent and the objects within their environment is always mediated by cultural means including tools, artefacts and signs; the researcher can be no different. This natural constraint means that, as explained in Chapter 5, we can only project a future based on past, culturally mediated experiences. An awareness of these constraints make the researcher adopt a more prudent stance when it comes to suggesting ways in which research findings can be applied to present or future situations. Given that we are, after all, in the business of predicting the future when we design school curricula, the difficulties become only too apparent.

The study has gone some way to demonstrate the potential of Activity Theory as a lens through which to examine learning in domestic contexts. This thesis also sees the use of Activity Theory in the exploration of home ICT use for the first time; this is an important contribution. The graphic modelling of Activity Systems, the notion of 'nodal triads' and the depiction of the core components of Activity with an Activity 'checklist' can be seen as contributions to the existing corpus of knowledge on the 'operationalising' of Activity Theory as an analytical framework. It is, however, a modest contribution and serves to point to the potential of Activity Theory in providing different insights into the complex interrelationships that constitute what we think of as 'learning'.

It is not for a researcher to extol the attributes of personal research project because it will be viewed from a naturally biased perspective. As far as strengths are concerned, it is felt that the study identifies some extremely important areas that are usually ignored when it comes to the use of ICT; in the home or at school. The state of the present technology in terms of the IBM compatible computer and ubiquitous proprietary software cannot be ignored.

The study identifies, arguably for the first time, the curious relationship between the setbacks, contradictions and problems that arise as a direct result of the inherent instability of the technology and young people's motives for learning more about the technology to overcome these 'technical' problems. The outcomes of the project also suggest a causal link between the 'resources' that a learner is able to access as a result of his or her Activity and 'successful' learning used to overcome these 'problems'.

At a more local level, is the contribution of this study to practice in Gibraltar has been extremely significant as it has modified the way learning is perceived. Fortunately, the context within which this study has unfolded (see Appendix 1) means that research projects such as this are able to influence political decisions such as the lowering of import duty on computer equipment, steer procurement policy for schools and ultimately, the size of the community also facilitates the dissemination of research findings in terms of things such as In-service training and awareness for teachers and parents. The publication of guidelines for parents on children's home computer (ongoing) use is another direct effect of this study where the message is that what is done in the home, in respect of ICT, should be valued and not dismissed.

9.4 Suggestions for further research

There is a need to further explore the extent of the reliance of the learner on a community pool of resources; in other words, does the key to successful learning lie in the resources which people are able to access? This has implications for schooling, given that the factors identified as conducive to ICT learning in the home would seem to be precisely those that traditional schooling is not equipped, or able, to afford. Time to experiment and 'mess around', would seem to be too much of a 'hit and miss' affair for many schools to adopt and would involve a cultural sea change both in the United Kingdom and in Gibraltar.

In a recent Professorial Lecture, David Buckingham (Institute of Education, 2005) describes the widening gap between the culture of the school and the culture of children's lives outside school. He explains that children who use the internet at home are likely to be developing a strong sense of their own autonomy and authority as ICT users yet this is what is, more often than not, denied to them in school. Further work, therefore, needs to be undertaken in the exploration of the means by which the effects of this home-school dichotomy could be mitigated. If the outcomes of this and similar projects are to be translated into policy, further research will be required to establish the desirability and feasibility of official recognition, sanction and support for ICT in the home.

This has been also highlighted in the on-going debate about the effectiveness of school-based ICT in the United Kingdom (Sefton-Green, 2004; Buckingham, 2005; PELRS Project, 2007). Pearson and Somekh (PELRS, 2007) the directors of the *Pedagogies for E - Learning Resources* recognise

the importance of the social aspects of learning by incorporating the way children learn in the home into the school scenario and encourage participating schools to foster the sharing of expertise and skills between pupils and thus allowing knowledge to be shared by peers, rather than always controlled by the teacher. Merchant (2005) argues that there is a pressing need to develop models of classroom practice that can tap into the 'communicative potential' of these new technologies. Similarly, Sefton-Green (2004) in his literature review on informal learning with technology outside school for FutureLab, finds that, 'left to themselves, children can get a lot from experiences like games or chat rooms' and schools should therefore take into account all of the 'informal' learning that is taking place outside the school.

The methods used may also be seen as an application of Castells' (1996; 2004) 'network theory' at a micro-level. The definition of Castells' (2004, p.3) 'networks' as set of interconnected nodes immediately resonates with Engström's (1987) modelling of Activity as a triangle. Castells (2004, p.3) definition continues:

> A node is the point where the curve intersects itself. A network has no centre, just nodes. Nodes may be of varying relevance for the network. Nodes increase their importance for the network by absorbing more relevant information, and processing it more efficiently. The relative importance of a node does not stem from its specific features but from its ability to contribute to the network's goals. However, all nodes of a network are necessary for the network's performance. When nodes become redundant or useless, networks tend to reconfigurate themselves, deleting some nodes, and adding new ones. Nodes only exist and function as components of networks. The network is the unit, not the node.
>
> Castells (2004, p.3)

A perspective from which to view Activity Theory in conjunction with Castells's notion of networks would seem to be an extremely powerful concept and warrants further attention as a tool for the socio-cultural analysis of educational processes. The study points to a potential area for further research in terms of *how* learners access these 'networks' and the relationships that may or may not exist between successful learners and these networks.

Technology is subject to rapid change and it follows that home is the best location from which to find new uses for it. The undoubted educational potential of the internet as an interconnected, social space, coupled with the rise of social software such as web-logs or 'blogs', video and music sharing sites and 'Wikis' present new and exciting challenges.

9.5 Concluding Comments

The idea for this study arose from a genuine sense of wonder at how children seem to teach themselves and become familiar with computers and software after a few days, some, only after a few hours exposure to the equipment. Most of this learning has taken place in the home environment and not in the school. The young people interviewed provide clear testimony in support of this and leaves little room for doubt. The interviews also clearly demonstrate how young people are capable of 'learning to learn' and transfom the outcomes of their activity systems into 'digital capital' (Merchant, 2006).

Participation in an Activity System, as we have seen, implies participation in other supporting Activity Systems and their outcomes, sometimes by proxy, sometimes directly. What is significant here is that the tasks and activities are undertaken by these young people without necessarily being aware of all the intricacies and complexities of every action

and operation involved. Most formal education systems expect children and young people to have knowledge and skills at their fingertips; the assessment and qualification systems clearly reflect this. The real situation is rather more complex. The notion of having all knowledge readily available in one's head would seem to be outmoded and increasingly irrelevant to modern life and the workplace. This is why bank tellers and shop assistants use calculators and adding machines, researchers use reviews of literature, doctors refer to consultants and consultants, in turn, refer to other colleagues, as and when required.

It is true that many young people seem to enjoy a natural predisposition for technology, and for much of the time are engaged in learning how best to use it from the relative comfort of their homes. As educators, the challenge would seem to be to find ways of applying what we are beginning to learn to school contexts if we are to help the young people of the Web 2.0 generation connect with what goes on in schools.

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Appendices

Appendix 1

The location of the study – Gibraltar

The Rock of Gibraltar is a tiny Jurassic limestone peninsula situated at the southernmost extreme of the Spanish mainland with the Mediterranean to the East and the Atlantic to the west (see map below). It lies, roughly, at the bottom of the Spanish "Costa Del Sol" about 40 kilometres from the Spanish coastal resort town of Marbella. It is linked to the adjoining low-lying Spanish territory by a sandy isthmus about 1.6 kilometres long and roughly 1 kilometre wide. 8 kilometres across the Bay of Gibraltar, to the west, lies the Spanish port of Algeciras and approximately 28 kilometres across the Strait, to the south, is the northernmost coast of Morocco and North Africa.

Gibraltar in context

The Rock itself runs from north to south for a length of nearly 4.8 kilometres. It is has a total area of some 7 to 8 square kilometres. Its highest point is approximately 470 metres. The top of the Rock is a sharp, knife-ridge extending for about 2400 metres from the north escarpment, which is virtually inaccessible, and then sloping gradually to the south for about a mile, to terminate at the southern extremity. The whole upper length of the eastern face is inaccessible and the steep upper half of the western slopes is uninhabited and has been designated a nature reserve.

Broadly speaking, the population is concentrated in the western side of the Rock resulting in a densely populated town area and in slightly more spacious residential estates which have been developed to the north of the town. All buildings and institutions are therefore also situated on the Western side. More recently the large harbour reclamation (over 30,000 sq metres) has permitted further land to be developed for large scale housing projects. The natural features of Gibraltar preclude all possibility of agriculture and major industrial production.

Gibraltar's name comes from Tarik, the leader of the Arabic army that invaded Spain in the eighth century. Over the centuries the Arabic name Gibel Tarik was corrupted to "Gibraltar". The Rock remained in Arab hands until an unexpected attack by the Spanish in 1309. This brief occupation was interrupted in 1333 and again reverted to Moorish control, but finally the Spanish reclaimed it and it was to remain that way for a further 240 years. In this time they developed Gibraltar as an important military and naval base.

Britain became interested in Gibraltar in the time of Oliver Cromwell, but the opportunity to capture it did not arise until the War of the Spanish

Succession. It was then seized by a combined Anglo-Dutch fleet under Admiral Rooke with British sovereignty formally ceded to the British crown in 1713 by the Treaty of Utrecht. The present population (approximately 20,000 native Gibraltarians although the total population is nearer the 30,000) is made up of people who were attracted to the territory by the presence of the British garrison and the promise of commerce or employment that this represented. The present population thus evolved form extractions as diverse as: Spanish, English, Welsh, Irish, Scottish, Sephardic Jews, Maltese, Italian and Genoese.

Gibraltar became thus a British Garrison and in 1830 was declared a Crown Colony. Spain, The Treaty of Utrecht notwithstanding, has nonetheless attempted to regain the rocky promontory by force on several occasions. Gibraltar has been besieged 15 times, the most famous being the Great Siege in 1779 which lasted more than 3 years. More recent years have seen the closing of the Frontier to Spain between 1969 and 1985, this has given rise to considerable anti-Spanish feelings amongst the Rock's population. There are still some border restrictions imposed by Spain on the frontier between British territory and the Spanish hinterland.

There are, however, indications that international conflicts and world events have, quite naturally, pushed Gibraltar issues onto the political back-burner. Negotiations between Britian, Spain and Gibraltar in 2006 have resulted in a series of agreements which should see the lifting of most of the existing restrictions. In spite of tensions, Gibraltarians still spend a substantial proportion of their leisure time in Spain given the lack of open spaces on the

Rock and recreational amenities that could be made available in such a restricted space.

Most Gibraltarians are naturally bilingual (English-Spanish). English is the official language and is used in government, education, in all public institutions and most businesses. Spanish, along with the local dialect, has become the vernacular language and is used for most colloquial situations although language code-switching is common practice amongst native Gibraltarians (Britto, 1993).

Given the history and the security offered by a British identity, the judicial system and Gibraltar's public institutions, including the education system, are derived entirely from their respective English counterparts.

The Economy

The twin pillars of Gibraltar's economy are Tourism and the Finance Centre. The Finance Centre obviously relies heavily on ICT 'knowledge workers' and there is no, at least not publicised, ICT skills shortage when it comes to the recruitment of young people into the industry. The needs of service industries and construction are mostly met by a Spanish, Moroccan and British expatriate labour force, with a high percentage of established Gibraltarians forming a professional cadre of lawyers, doctors, teachers civil servants and so on. By most standards, Gibraltar is a prosperous community with all public sector employees have parity of wages and salaries with their UK counterparts. Unemployment figures are negligible.

Bunkering and providing services to shipping is also an important source of income, given Gibraltar's strategic positioning at the mouth of the Mediterranean. Gibraltar is an overseas territory of the United Kingdom with

a separate constitution granted to it by the British Parliament. It is self-governing except in matters of defence, internal security and foreign affairs where it defers authority to Britain. Gibraltar entered the European Union together with the United Kingdom in 1973. The territory, however, is exempted from value added tax and the common customs tariff. Import duty is applicable to most goods and commodities (interestingly, except for computer hardware and software other than games) regardless of origin, including the United Kingdom. It should be noted that all goods, including foodstuffs, are imported and Gibraltar is only self-sufficient for potable water. All EU treaty provisions on the free movement of capital, services, and persons apply to Gibraltar except the movement of goods. This is subject to restrictions due to Gibraltar's position outside the Customs Union.

Appendix 2

Glossary of ICT terms used in the Thesis

A

Adsl

See broadband

adventure game

computer-based game which allows the exploration of a scenario or story in which the player is an 'adventurer'. Adventure programs used to be in text form only, often with long narrative descriptions, but they have now incorporated graphics. Some adventure games have graphics only. The user is encouraged to make decisions based on a limited set of rules or options predetermined by the author of the program. The outcome of the game depends on the decisions made.

analogue

signal which does not vary in discrete steps, but continuously from one level to another. For storage, processing and communicating with computers, analog signals (such as the output of a microphone) are converted into digital form using analog to digital converters (A-to-D or A/D). This is called digitization, as the information is then stored in binary code. *See also* **digital**.

anti-virus software *see* virus

application *see* software

authoring software

programs which help relatively inexperienced users create multimedia or hypertext documents.

B

back up

to make a duplicate but separately stored copy of the contents of a computer-held data set, software application, or individual files. Back-ups should be done regularly.

bandwidth

range of signal frequencies which indicates how much data can pass along a channel at one time. Broadband networks, the basis of the information superhighway, allow video signals to pass at high speed; narrowband networks tend to be text-only and are slower. For example, voice over the telephone network requires a bandwidth of 3 kHz, while uncompressed video requires a bandwidth of 6 MHz.

bits per second (bps)

unit of measurement of data transfer speed. For example, the bit rate of widely used modems is in the range 300 to 56000 bps (or 56 kbit/s: higher rates are given in kbit/s).

boot

to start up a computer. The computer is regarded as 'bootstrapping' itself by loading the program which starts its operating system.

broadband

informally used to mean 'faster than common networks', and so the actual meaning depends on what is common at the time. Currently broadband is regarded as starting at 34 Mbit/sec (Mbps) – under this classification, all commonly occurring local area networks (such as Ethernet) are narrowband.

browser

software used to search and retrieve information from the **world wide web**. Netscape, Microsoft Internet Explorer and Firefox are browsers.

C

card

circuit board that plugs into a computer to provide a new function, such as sound or video input and output.

CD writer (compact disk writer)

hardware device which can save information on to a CD.

CD-ROM (compact disk read-only memory)

computer storage medium, optical disk which physically which resembles a 12 cm audio CD but contains a range of data types stored digitally, such as words, graphics and sound rather than simply sound. CD-ROMs can store up to 250,000 pages of text with a capacity of 650Mb. Once written, the disk cannot be altered, hence 'read-only'.

central processing unit

(see processor)

CHAT (MIRC / MSN)

Software used for text and graphics based internet communications. Voice communications are also possible in some versions.

compatibility

pieces of equipment and/or software which are capable of being used together without special modification or adaptation are termed 'compatible'.

computer program *see* program

crash

sudden failure of software or hardware, often resulting in no response to mouse or keyboard actions.

cursor

screen representation of a pointer which responds to mouse or keyboard movements.

D

data compression *see* compression

database

structured collection of conceptually related data or data files organized and stored in a computer system. Databases can be set up in different ways: for example, the simplest are tables with a row for each record (a set of related items such as an individual's name and address) and a column for each field (the categories within each record such as last name, house number, street, town, etc.). Hierarchical databases hold their data in tree structures, e.g. one for a school might divide into staff and students at a high level, with individual names at the lowest and divisions like department or class in between. The most powerful databases use a method of storing data which does not restrict the way users can query it.

default

computer or software settings as set in the factory or by the software creator.

defragment (defrag)

A process whereby the data on a hard drive is stored contiguously making data access faster.

desktop computer

traditional office or personal computer. This has three or more parts linked together by cables: the system unit which houses the central processing unit and disk drives, the monitor, a keyboard and probably a mouse.

desktop publishing (DTP)

production via a desktop or personal computer of page layouts which combine words, graphics and images with different sizes and styles of type and form the master copies of materials such as newspapers, magazines and leaflets.

dial-up

connection to the internet or another computer over an ordinary telephone line.

digital

in computing, the representation of information as discrete digits, or **bits**. Contrasted with **analogue**.

digital camera

camera which captures and stores images as digital (electronic) information. Images can be stored either on a memory chip in the camera, on disks or in some cases on plug-in memory cards.

digital versatile disk (DVD)

data storage medium, optical disk capable of storing high quality video as well as data such as programs, text, still images and sound (also known as 'digital video disk').

digitized speech

electronic means of recording, storing and reproducing human speech, similar to using a tape recorder. Digitized speech is increasingly used in electronic communication aids as well as or in place of **synthesized speech**.

display resolution see resolution

download

to use one computer to obtain data from another computer, electronically. Downloaded information can be incorporated into other files, displayed, printed or saved.

DVD see digital versatile disk

E

electronic mail see e-mail

electronic whiteboard (also Interactive Whiteboard)

interactive screen modelled on a standard whiteboard that is linked to a computer. The computer image is projected onto the screen, sometimes using a standard data projector (often ceiling mounted). The user interacts on the screen with a 'pen' and the screen sends information back to the computer about the pen's movements, enabling the user to interact with various software packages.

e-mail (electronic mail)

messages or letters sent and received in electronic form via computers.

F

Format

To prepare a hard drive for the installation of software

G

gigabyte (Gb)

1024 megabytes or one thousand million **bytes**.

graphical user interface (GUI)

screen representation of the computer's control system, enabling the user to move an on-screen cursor, usually with a mouse, and 'click' on pictorial representations or icons in order to make the computer perform various instructions. Mouse movements usually have keyboard alternatives.

graphics

charts, diagrams, pictures, symbols or animations on a computer screen which may be printed out or saved to disk.

graphics card

circuit board that controls the screen representation of images.

H

hard disk

computer storage medium, rigid disk usually made from aluminium, coated with magnetic material and hermetically sealed, fitted internally in a personal computer.

hardware

physical components of a computer or a communications system, including both mechanical and electronic parts, such as the processor, hard drive, keyboard, screen, cables, mouse and printer. Contrasted with **software**.

hardware compatibility

computers which can use the same software because they share or can use the same operating system.

I

icon

in a **graphical user interface**, a small symbol or picture on the computer screen, for example representing a software package or a data file. The user clicks on the icon to start the package or open the file.

ICT *see* information and communications technology

information and communications technology (ICT)

application of modern communications and computing technologies to the creation, management and use of information.

information technology (IT) *see* information and communications technology

install

to copy all the files of a software package on to a computer and make any changes needed to existing files so that the software then works. Installation or set-up programs do this for users.

integrated package

software package, a suite of applications which have a consistent interface and include a word-processor, spreadsheet and database, bundled together. Other

software may be included, such as graphics and communication modules. Data can be transferred easily between the applications.

interface

equipment or software which enables a user to communicate with the 'raw' system they are accessing, for example, a menu or icons on a screen (*see* **graphical user interface**). Also any join between items of hardware or software, such as connections with printers. For a peripheral device such as a printer to communicate with the main computer, their interfaces must be compatible.

Internet

also known as the 'net', the inter-communicating computer networks which host and provide access to the world wide web, file transfer, e-mail, news and other services.

Internet relay chat (IRC)

method of ensuring 'real-time' and multi-user communication. When Internet users are on line simultaneously, they can communicate by sending text messages which are read almost as quickly as they are sent – i.e., on a par with normal face-to-face conversation.

Internet service provider (ISP)

organization with a direct connection to the **Internet** acting as an intermediary for other users, providing them with an e-mail address and software, access to the world wide web, and often space on web servers for home pages etc.

ISP *see* **Internet service provider**

IT *see* **information and communications technology**

K

kb kilo-bit, kilobyte.

kbits/sec

unit of measurement of data transfer speed, 1024 bits per second.

kilobyte (k)

unit of measurement of storage capacity, 1024 bytes, or one thousand.

L

LAN *see* **local area network**

laptop computer

portable computer, small enough to carry around and use on a lap.

LCD *see* **liquid crystal display**

liquid crystal display (LCD)

thin flat screen used in portable computers, digital cameras and watches where space is at a premium.

local area network (LAN)

communications system linking computers within a restricted geographical area such as a building or campus. This also allows computers to share information from a central source.

M

Mbits/sec

one million bits per second.

megabyte (Mb)

1024 kilobytes or one million **bytes**.

megahertz *see* **clock speed**

memory

used in contradictory ways by those familiar with computers, so a term to be wary of. Logically one of its meanings encompasses all the areas used by a computer to store information, including the long-term storage area used by computer systems to hold programs and information files (on a personal computer, the hard drive). However, its meaning is sometimes restricted to the 'random access memory' (RAM), which is the computer's temporary working store, usually a single chip which can hold very large amounts of data and manipulate it very quickly, but will not retain it when the power supply is switched off – for that, it must be saved to the hard disk. The user can record things in both the above forms of memory. However, some forms of storage are 'read-only' (ROM), with information which has been recorded during manufacture and cannot then be altered, added to or erased, e.g. CD-ROMs.

menu

list of options from which a user can select in order, for instance, to start a program or open a file.

MHz *see* **clock speed**

monitor

screen used with a computer, also known as a VDU (visual display unit) or DSE (display screen equipment).

motherboard

main printed circuit board (PCB) in the computer, which holds the principal components. The processor and clock chips will either be plugged into or soldered to the motherboard. *See also* **central processing unit**.

MP3

standard for storing digitized audio in compressed form.

multimedia

combination of moving images, graphics, text and sound. A multimedia machine is fitted with hardware such as sound and video cards and a CD-ROM drive, and may include peripherals such as a camera, microphone and scanner.

N

National Grid for Learning (NGFL)

government initiative intended to connect all schools, colleges and universities to the internet, provide them with information and resources and prepare them for interconnectivity.

network

electronic communications system linking computers, computer systems and peripherals such as file servers and printers.

O

operating system (OS)

program or set of programs which controls the computer. Different types of computer use different operating systems, including Microsoft Windows XP and successors, and MacOS.

P

Package

software suite designed for a particular application or job, such as word-processing or accounts.

PC *see* personal computer

peripheral

hardware device which can be plugged into the computer to perform some additional function such as a disk drive, a printer, an overlay keyboard or VDU.

personal computer (PC)

computer designed for individual users rather than several users at any one time. Usually taken to mean an IBM or IBM-compatible machine.

printer

device used to produce hard copy (paper copy) from a computer. Various types are available: a dot matrix printer produces output by firing pins against an inked ribbon; bubble or inkjet printers squirt or squeeze ink through pins, and a laser printer works in a similar way to a photocopier.

procedure

ordered and structured commands to perform a particular task. For example, a Logo procedure for turning two lights on and off in order might be: TURNON 1 WAIT 10 TURNOFF 1 WAIT 10 TURNON 2 WAIT 10 TURNOFF 2.

processor *see* central processing unit

program

In this American spelling, standard term for the set of instructions carried out in sequence by a computer to perform a given task. Programs are written in English-like programming languages and are then translated into binary code by an intermediary program called a compiler. Large **software** systems are normally sets of several programs.

programming language

artificial language constructed to enable the user to communicate with a computer and to create **programs** for it to run. Examples of programming languages used in school are Logo and BASIC.

R

Re-format

To completely erase all the data on a hard drive. A complex procedure, usually used as a 'last resort' process to attempt to restore the computer to a working state.

resolution

clarity and sharpness of pictures and text as they appear on the screen or on paper, often measured in dots per inch (dpi). The greater the dpi, the better the resolution. Screen resolution is measured by the number of pixels in a row and the number of rows and columns, together with the size of the pixel on the screen. The larger the screen, the higher the resolution should be.

S

scanner

device by which hard-copy pictures and text can be converted into digital form for use on a computer. Small handheld devices work by rolling the scanner head across the paper. Larger flatbed scanners work rather like a portable photocopying machine. With a speech synthesizer, it is possible to scan text into the computer and hear it read aloud. Can also be used to read bar codes and convert them into numeric data.

screen resolution *see* resolution

search engine

software, often found on web sites, which searches for information on the world wide web or text-based databases.

server

computer system that provides a particular service to devices on a network. In the context of the client–server model, a server is the software on a remote computer servicing a **client** with the resources the client requests. In a local network, a file server holds system software on its hard disk, and is usually the most powerful machine in the system. A network may have a number of file servers storing data of a particular type. Network users can access their own files remotely and interchange information with these central stores.

software

generic term for all computer programs. Software falls into two major types: applications such as spreadsheets or databases, and systems software such as MS-DOS or Windows. In addition, there are utilities or tools.

sound card

printed circuit board that can be plugged into a slot in the **motherboard** of a computer to expand its capabilities and allow sound output. Sometimes referred to as a sound board.

spreadsheet

computer program which allows words and figures to be entered into individually identifiable cells on a grid format. Cells can be linked by formulae, so that altering numbers in individual cells will produce an alternative set of results. Spreadsheets may be used to model situations whose rules are governed by mathematical relationships

such as numerical series like Fibonacci or the management of a budget account, and have been extended to act as simple databases and word-processors.

surf

popular term for exploring the world wide web.

U

uninstall

use of a program to remove unwanted software from a computer.

upgrade

new version of a piece of software which is made available to registered users of an earlier version at a lower price than is charged to new users. Usually identified by a later version number – e.g., 1.1, 1.2, 1.3, show updates on version 1.0, whereas 2.0 would signify a major upgrade.

upload

to transfer data from a small computer (such as a personal computer) to a larger or main one. The opposite of **download**. Also the transfer of data from a storage medium to a computer.

utility

software, usually small, which is designed to perform a single routine task, either on whole files, such as copying, deleting and sorting files, or as an extra bolt-on which extends the capacity of an applications package. *See also* **software**.

V

virus (and trojans)

mischievous or destructive software transferred covertly to files and applications, often via the internet or with other files on a disk. Some can disable a computer or network once activated and must, if possible, be removed using anti-virus software.

W

web pages or web

file created in **hypertext mark-up language** and displayed on the world wide web.

web site

area on a server linked to the internet which is devoted to one organization or individual's **web pages**.

Windows

originally the **graphical user interface** (GUI) between applications and the operating system developed by Microsoft for IBM-compatible personal computers, and from Windows 95 on, the operating system and interface combined.

Wireless (see lan)

Usually refers to a radio controlled connection between peripherals or computers on a network.

word-processor

software originally devoted to the creation, editing, formatting, storage, revision and printing of text, but currently often including the capacity to include graphs, spreadsheets, and photographs, and to produce sophisticated page-layouts.

world wide web (WWW)

also known as the WWW, W3 or simply the web, a distributed information service on the internet of linked **hypertext** documents accessed using a web browser such as Microsoft Internet Explorer or Netscape. On the web, any document can be linked to any other document. Web 2.0 is the tem used for the second generation of internet development. This is more a term to denote a new way of using the internet and its affordances than new technologies.

New affordances include Blogs, WiKis and similar 'social' software.

Appendix 3
Interview questions (contextual)

Subject details

Name:................................. **Age:......**

M/F:.......... **Time: ......** **Duration:.......**

Notes

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Read to interviewee:

I am investigating how young people go about learning computer skills.

Pause for queries

The first part of my investigation involves me asking you a few general questions about your computer and ICT use at home. This part is for me to get to know as much as possible about your computer skills. Later on, I may ask you to discuss your answers with me.

I am interested in *how* you would go about tackling one of these and the strategies, 'tricks' and things you use to get around problems.

Pause for queries

Do you mind if I record the interview?

Pause for queries

Are you ready?

Pause for queries

Any questions before we start?

Pause for queries

1. What sort of ICT system do you have: (Prompts: Printer? CD/DVD drive? CD/DVD writer? Dial-up internet? ADSL?)

2. How often do you use it? (Prompts: How many hours a day, roughly? Does this cause problems at home?)

3. What sorts of things do you use it for? (Prompts: typical activities engaged in: games, chat, school-work and so on.)

4. Do you consider yourself to be good at ICT? (Prompts: do you consider yourself to be an expert? Do you help other people? Do other people help you? How?)

5. Can you do any of the following? (Prompts: How did you learn? Where did you learn? Was it difficult? Were there any problems? Were you on your own?)

Download and play MP3s

Use MIRC or other chat programmes

Find information on the internet

Recognise when you have a computer virus /Trojan

Rid your system of an infection or attack

Format your hard drive and reinstall the operating system

Build your own computer

Use a word processor

Use a spreadsheet

Change the resolution of your display

Troubleshoot/fix/repair your equipment

Make copies of CDs or DVDs?

Recover a deleted file or lost information?

6. Is there anything else you do with a computer or the Internet at home, (Prompts: programming, creating your own web-page or site, music and so on)

7. How did you learn about computers and ICT? (Prompts: self taught, school, someone else?)

8. Do you have friends who are also interested in computers? (Prompts: Is it a large group? Do you often talk about computer matters? Do you ask them about computer related problems? Do they ask you?)

Appendix 4

GOVERNMENT OF GIBRALTAR
DEPARTMENT OF EDUCATION & TRAINING
40 Town Range
Gibraltar

Education Adviser: Mr J. Britto

Our ref: sch/0/17

Your ref:

The Parents /guardians of:

Dear

Re: Research into home computer use

The purpose of this letter is to formally request your permission for me to interview your daughter as part of my studies for a Doctor of Education Degree with the University of Sheffield. This study is funded and supported by the Department of Education & Training.

My investigation involves the interviewing of several young people; one of which is your daughter. The questions will revolve around her computer and internet use at home. She will be asked questions about her general computer skills, the equipment that she has, where this is located, how often she uses it and so on. Your daughter's name has been brought to my attention by other young people and teachers during my visits to school. She has been described as being 'quite good' with computers and I have been told she uses ICT quite a lot. My main interest is how young people go about learning computer skills in their homes. I am also interested in *how* she goes about tackling problems to do with her computer use as well as the strategies, 'tricks' (or even other people) she may use to help solve these.

The interview will be recorded and both your daughter and yourselves will be given the opportunity to listen to the recording before it is used. Your daughter already knows about the interview and has agreed to it but as you will understand, I also require your permission. The interview will either take place in the school or we can arrange for another venue at your convenience.

You are more than welcome to attend the session should you so wish. Please let me know if you grant permission either through your daughter's headteacher or return the attached permission slip via the school.

Please do not hesitate to contact me should you require more information about the study.

Many thanks,

Joey Britto

To: Mr J Britto, Education Adviser, Department of Education & Training

This is to inform you that I do / do not wish my son /daughter to be interviewed as explained in your letter.

Name of pupil: .....

Form group: .....

Telephone number: .....

Parent's or guardian's name: .....

Address:

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.....

.....

Telephone number: .....

e-mail: .....

Signed: .....

Date: .....