

Children's Use of the Internet

A Review of the Research Literature

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Commissioned by the National Children's Bureau

March 2002

Document Version 0.1



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Introduction

The aims of the review

The industrialised countries are witnessing an expanding domestic market as well as a significant educational market for the Internet. Many families are going online for the first time. Schools are incorporating web-based materials into the curriculum. For adults, the workplace is transformed into a technologically-mediated environment. Particular attention among the public and policy-makers centres on children and young people. This group, supposedly 'the digital generation', is important because, it is claimed, it 'represents the future', it is 'in the vanguard' and yet it is also vulnerable, 'at risk' from new information and communication technologies (ICT).

It is timely to ask what we really know about children and young people's use of the Internet. A rigorous examination of the current ways in which the Internet is actually being used should improve the currently weak evidence base for policy in the short-to-medium term¹ while undermining the excessive hype – both optimistic and pessimistic – which surrounds children and the Internet.

In order to inform the considerable policy interest and regulatory imperatives in this domain, this publication provides a critical review of empirical research conducted to date on children's use of the Internet.² Such research is so recent that this review may claim to include 'the first hundred articles', from the earliest publications up to work in progress by early 2002. The review set out to ask:

- What do we know already? What empirical research has been conducted on children's use of the Internet?
- How strong is the available evidence? How should research be evaluated in terms of theory, methodological rigour and policy implications?
- What do we need to know next? What promising or influential research exists to guide the emerging research agenda?

Approaching the review

The strategy included:

- An active search centred on five key concepts: (1) children and young people; (2) Internet; (3) use in home/leisure; (4) empirical research; (5) UK to produce a near-comprehensive core set of studies;
- Selected studies addressing: family/adults; new media/ICT/computers/computer games; school/community; theory and/or policy; non-UK based research, the aim being to include influential or 'guiding' studies that could be pursued further.
- Contacting researchers in the field in order to locate work in progress.³

¹ See Livingstone, S. (2001). *Online Freedom & Safety for Children*. London: IPPR / Citizens Online Research Publication.

² Henceforth the term 'children' will be used to refer to children and young people, as most research and discussion concentrates on those between 5 and 17.

³ Sincere thanks are due to those who found the time to reply: Amy Aidman, Ben Anderson, Elizabeth Bird, Christine Borgman, David Buckingham, Lynn Clark, Charles Crook, Keri Facer, Cecilia von Feilitzen, Leslie Haddon, Steve Jones, Robert Kubey, Geoff Lealand, Bella Mody, David Morrison, Keith Roe, Veerle van Rompaey, Julian Sefton-Green, Gill Valentine and Ruth Zanker.

- It did not seek to cover popular articles in the press, policy documents and debate, speculative/theoretical commentaries with no empirical content, or research mapping Internet content or concerned with the Internet as a technology or business unless specifically focused on children. Nor does the review address the sizeable literature on educational technology.⁴

The format of the review includes (1) a substantial overview of the research conducted on children's use of the Internet, (2) a brief statement of strengths, gaps and recommended directions for future research, and (3) a searchable, systematically annotated bibliography of over 100 articles and reports (these are referenced throughout by the use of numbered bibliographic items in square brackets).⁵ The review is interspersed with more detailed accounts of particular studies, to illustrate the character of the research conducted.

The emerging research agenda

A new field?

Children use the Internet mainly at home and at school. This review attempts to open up the 'black box' of the home to explore what the Internet means to children and their families at the start of the twenty-first century.

One should note at the outset that the 'answers' produced by research are provisional because the Internet – both as a technology and in its social contexts of use – is changing rapidly. Moreover, for many families the Internet is still a fragile medium, experienced as complex, unfamiliar, easier to get wrong than right, not yet taken for granted. Answers are also, inevitably, diverse because children (and families/households) are heterogeneous, divided by income, education, ethnicity, geography, lifestyle, etc.

Typically, a literature review overviews a well-established field in order to identify key traditions and debates and, most importantly, to draw out the main conclusions reached and evaluate the empirical support these have received. In the present case, the nature of the review was rather different because the field itself is new.

- As the Internet itself is a new arrival in UK homes, only a moderate number of studies have yet been conducted and published.
- Although public concern about new media often centres on children, empirical research on children tends to lag behind research on adults.
- Academic, public and policy-related discussions often rely on a few empirical studies being cited heavily, in support of conclusions that may go beyond the data collected.
- Increasingly empirical research projects are getting underway, but few have yet reported; hence current knowledge relies on early reports from work in progress.

On the other hand, no research domain starts out with a clean slate. Many of the articles reviewed here draw upon more established literatures, including research on:

⁴ Drawing the boundaries of this review proved particularly problematic in relation to education and educational technologies, for this increasingly includes the Internet, and the role of the home, but may make no especial point of doing so.

⁵ For this latter, I am most grateful to those who worked with me in constructing the bibliography: most of all, Shani Orgad; also Tamar Ashuri, Joelle Kivits, Vivi Theodoropoulou and Joe Ungemah.

- the nature and consequences of children's television viewing⁶
- the process of diffusion and appropriation of new domestic technologies⁷
- the incorporation of educational technologies into the classroom⁸
- the new field of Internet research in general⁹

An emerging consensus

Within the coming decade or so, the Internet will doubtless have become taken for granted within our homes, meaningfully embedded in the routines of children's daily lives. How the technology - and its economic, political and cultural dimensions - will have changed, and in what ways the Internet is judged beneficial or harmful, remains to be seen.

But already in 2002, the Internet has reached mass-market penetration in the UK. The regulatory, social and economic frameworks that will shape future contexts and consequences of Internet use are being developed. So, research is needed now, and cannot wait to see 'what becomes of the Internet' or the 'user'. Indeed, the hundred plus articles reviewed here already reveal some areas of broad consensus, both in framing the research agenda (below) and in early findings (subsequent sections).

In researching children's Internet use, three broad assumptions appear more-or-less consensual across the material reviewed.

1. *Avoid moral panics.* Rigorous empirical research should side-step the terms and values that fuel moral panics or public anxiety,¹⁰ though it should certainly address the policy agenda. Much of the research reviewed here therefore seeks to avoid normative or value-laden judgements, to the point where research is heavily descriptive of the nature and contexts of Internet use rather than attempting theoretical or explanatory accounts. To some extent, then, research trades depth for breadth, this also reflecting the comparative immaturity of the field.
2. *Contextualise Internet 'use'.* Rather than adopting the technologically determinist assumption that the Internet is external to, and so impacts on, society one should instead recognise how longer-term processes of social change (in the family and childhood, in leisure and lifestyles, in work and education, in social values) themselves shape the introduction of technology. If 'the Internet' is part of, constructed by, society then simple cause-effect questions are to be eschewed in favour of more complex, multidimensional accounts of the contexts and consequences of Internet-related practices.
3. *Children as agents.* Children themselves play a key role in establishing the emerging nature of Internet-related practices. In attempting an approach which is primarily child-centred rather than technology- or media-centred, researchers aim to avoid construing children as passive or vulnerable, as incomplete adults rather than as agents in their own right, actors in a social world partly, though only partly, of their own making.

⁶ See Calvert (1999), Goodman (1983), Morley (1986), Seiter (1993), Zillman et al (1994).

⁷ See Rogers (1985), Silverstone and Hirsch (1992).

⁸ See Loveless and Ellis (2001), Snyder (1998), Tyner (1998).

⁹ See Jones (1997), Kiesler (1997), Lievrouw and Livingstone (2001).

¹⁰ See Boethius (1995), Drotner (1992), Wartella and Reeves (1985).

Continuing debates

Other broad dimensions of the field remain contested. These largely concern claims regarding the nature of the field as well as the purpose of researching it.

1. *Children as a special group?* While the body of research on children and the Internet is growing, most research and debate on the social uses and impacts of the Internet neglects children, too easily presuming them included in discussions of 'the population' or unproblematically 'spoken for' in surveys of parents. Paralleling earlier debates about television,¹¹ it is difficult in practice to direct research attention towards children unless this is legitimated – in a manner which researchers are wary of – by emphasising parental anxiety and/or children's vulnerability. In other words, even when children are recognised as a special group rather than included under the umbrella of the population, this distinction may not always work in their favour.
2. *The Internet as a radically new technology?* Much published work addresses ICT or 'computers' or 'new media' generally, without addressing the technological and social specificity of the Internet in particular or the degree to which it may represent a break with earlier media. This is justified, at least in part, by the consistent finding that diffusion and patterns of use of each successive new medium resemble those of previous 'new' media. Other work on the Internet presumes this technology to be qualitatively distinct, thereby opening up new questions for research but also, to the extent that the case for 'innovation' is overstated, tending to reinvent the wheel. Striking a balance between recognising long-term continuities and innovative features of the Internet remains a challenge for research and policy.
3. *The 'Internet' as a singular technology.* Even in these early days of research on the Internet, it is already apparent that to talk of 'the Internet' is misleading, though such talk is commonplace in both academic and policy circles [104]. Rather, the Internet encompasses, first, a varied set of activities, or media, including chat, email, websites, etc, and second, an all but unmeasurably diverse and constantly changing content. This makes the Internet equivalent not to television, or radio, or the computer, or letter writing, and so forth, but to all of these media, and their associated contents and modes of engagement, in combination. Indeed, it is the interrelations among these contents and activities which is most interesting, certainly to young people.
4. *The value of critical research?* All research is value-laden, particularly in relation to the often-heated policy debates surrounding children and the Internet. Many researchers attempt to be produce 'information' which is as neutral as possible, resulting in largely descriptive research; others are broadly liberal, attempting to inform and legitimate a cautious balance between protectionist and rights-based regulation; still others assert the importance of adopting a critical position with regard to knowledge within both the academy and the policy community.

Before we can turn to early findings and further questions for research, it is clear that the dilemmas and debates facing researchers take us first into a consideration of questions of method.

Approaching the problem

The impetus behind this review is that policy formation should rest on a rigorous empirical base rather than speculation and supposition. Hence, questions of method are central, particularly because one reason that the available research remains sparse concerns the challenges of researching the private behaviour of children at home.

Available methods

¹¹ See Buckingham (1993), Davies (1997), Dorr (1986), Hodge and Tripp (1986), Livingstone (2002).

Research more easily tracks information and communication technology to the front door than it identifies the nature, quality and consequences of use within the privacy of the home. In responding to the challenge of 'opening the black box of the home', researchers are adopting one of three methods:

- *Surveys.* These often use national representative samples, though some use small convenience samples; these may be conducted face-to-face, by telephone or using a written postal questionnaire; most important, these may be addressed to adults, to parents, to children or to both parents and (their) children. They report statistical frequencies, differences and patterns of use but rarely explore a topic in depth.
- *Qualitative research.* This includes face-to-face interviewing, observations of Internet use, focus group discussions, discourse analysis, ethnographic work, diaries, etc; it may be in-depth, though not necessarily; it often combines several qualitative methods in one design; it generally relies on small samples, selected for their diversity rather than their statistical representativeness. This seeks to capture the variety of experience but cannot support claims about distribution or scale.
- *Multi-method approaches.* These combine qualitative and quantitative methods in order to obtain the 'best picture' of children's Internet use, 'triangulating' the different methods so as to identify and address any differences in findings or interpretation arising from the use of different methods.
- *Other.* Beyond research addressing questions of use, there is also a growing body of policy analysis and of content analyses of 'child-oriented' web-content, together with a scattering of other approaches to the field (e.g. case studies of specific initiatives).

Preferred methods

Table 1 maps the sources of empirical support for the 100+ articles reviewed here, crossing types of method with the geographic scope of the work conducted (UK, European, North American, elsewhere).

Several caveats are in order:

- The literature search was conducted using only English-language resources.
- UK research was searched comprehensively, that from other countries selectively.
- Several different articles report on the same project.
- Some studies are very small (e.g. qualitative work on 3 families, or surveys of 100+ people).
- Theory and policy were not searched comprehensively but only to identify indicative/influential articles.

Table 1
Research on children's use of the Internet, by method and by location of research focus

Method used	Location/focus of the empirical work			
	UK	Other European	North America	Other (rest of world/unspecific)
<i>Survey</i>	16, 17, 36, 56, 85	9, 31, 32, 48	26, 27, 34, 35, 51, 55, 63, 65, 66, 77, 86, 87, 90, 97, 98, 99, 100, 116	60, 84, 112
<i>Qualitative</i>	8, 18, 22, 23, 70, 78, 83, 111, 113, 126	115, 127	30, 46, 71, 124	39, 45, 54, 62, 64, 91, 114
<i>Multi-method</i>	12, 69, 76, 101, 104, 106, 110, 129, 130	19, 21, 82, 108	88	58, 59, 68
<i>Policy analysis</i>	7, 14, 61	118	103, 120, 128	57, 121
<i>Analysis of web content</i>	28	44	50, 74, 93	25, 43, 49, 81
<i>Other (theory, review, etc.)</i>	10, 15, 40, 42, 73, 79, 92, 102, 105, 117, 122	29, 38	13, 24, 33, 37, 47, 53, 75, 80, 89, 94, 95, 96, 107, 109, 119, 125	72

Note: cells contain the bibliographic numbers assigned to each item reviewed (see Bibliography)

From Table 1, we may conclude that:

- Overall, the number of projects that have been or are being conducted in the UK is modest.
- Research in the UK is spread evenly across qualitative and quantitative approaches. Compared with North America, the UK particularly lacks quantitative survey research (and vice versa). Moreover, while the combination of qualitative and quantitative research is widely valued, little is conducted.
- The research literature, and research agenda, is being led by North American research. As yet, little is known as yet about web contents available for or used by children. Little policy analysis is being published by independent/ academic researchers.

Furthermore, it is noteworthy that although the social sciences strongly favour interdisciplinarity - the theoretical triangulation of multiple perspectives on a single phenomenon to maximise understanding - thus far little interdisciplinarity exists. Most qualitative work draws on media and cultural studies, making for insightful accounts of the contexts and nature of Internet use, but leaving open questions of representativeness and demographic distribution, and most quantitative work is conducted by

survey researchers, making for reliable and representative but often not theoretically informed findings.

Few studies take a psychological perspective [although see 49, 79, 80, 94, 96, 99]. Few political science studies on e-democracy address children. Little publicly available research investigates children as a new economic market for electronic products and services [although see 4, 69, 70, 103]. And few analyses from a technological or information systems perspective include empirical research on users, particularly on children, though the abstract concept of the user is increasingly stressed.

Research challenges

There is now an interesting and thoughtful literature on methodological issues in relation to research with children generally.¹² Such research raises some particular difficulties, although these are not always made explicit, nor always adequately addressed, in the Internet/media research literature.

- *Use of adult informants.* Tempting though it may be to interview parents or teachers, this produces a faulty account of children's experiences and actions. Particularly one must recognise that it is integral to childhood to generate tactics to live within, or circumvent, the strategies by which adults attempt to guide or constrain children. Parents simply may not know how their children use the Internet. Asking parents and children about the rules in their home for Internet use tends to produce highly discrepant responses, and who is to adjudicate?
- *Importance of a child-centred perspective.* Even when interviewing children, it is easy for adult researchers unwittingly to impose their perspective on children's experiences, interpreting their responses through an inappropriate lens. Children define key terms differently – calling the Playstation 'a computer', not being sure when and whether they are online, stating in surveys they value the Internet as a source of information (but meaning, games cheats and football results more often than educational materials). Framing and interpreting research with, rather than 'on', children, goes some way to improving matters.
- *Access.* While the use of the Internet in school, libraries or the workplace is relatively public, and hence fairly accessible to the researcher, use at home is largely private. Observing media use in the child's bedroom, installing software to log computer and Internet use, observing family interactions around the PC, keeping time-use diaries and, even, simply asking children about their home-based leisure, all involves an unusual degree of intrusion which may compromise the quality of the data. Moreover, the more conscientious or subtle the research methods, the smaller the number of households to which they can be practicably applied.
- *Ethics.* Researching children's leisure requires an explicit ethical framework which is often though not always followed. This agenda includes ensuring informed consent by children, treating children as collaborators in not objects of research, showing sensitivity to the meanings and language children use, respecting privacy, including privacy between children and parents, and so forth. Some areas remain problematic: can one really hope to discover young people's private uses of the Internet – their chat, flirtations, naughtiness, embarrassments, uses of pornography?
- *Effects.* Media research has, throughout its century-long history, attempted to establish the cognitive, emotional and behavioural effects on children, with only partial – and much contested – success.¹³ Thus, some of the questions now being asked of the Internet (does inadvertent exposure to pornography produce long-term harm, does playing aggressive games online make boys more aggressive, does immersion in a branded consumer culture produce a more

¹² See Buckingham (1991), Graue and Walsh (1998), Frenette and Caron (1995), Greig and Taylor (1999), Holmes (1998), Hood et al (1996), Hoppe et al (1995), Livingstone and Lemish (2001), Mahon et al (1996), Mauthner (1997), and Morrow and Richards (1996).

¹³ See Barker and Petley (1996), Livingstone (1996), Rowland (1983).

materialistic generation, is the Internet changing the way children think and learn?) are more or less impossible to 'answer'.

- *Linking content and use.* Strikingly, while television audience research has shown that meaning emerges from the interaction between content and use, with different users - because of their different motivations, understandings or cultural positions - interpret the 'same' media text in diverse ways, research on Internet use - whether of educational materials, pornography or shopping sites - is proceeding with no explicit characterisation of precisely what it is that users are making use of.

As one moves from *questions of access* (counting who has what in the home or school) to *questions of use* (its nature, quality, social conditions, personal meanings), researching children's use of the Internet is no easy matter.

Main research themes

In terms of substance, the articles reviewed here can be classified according to their primary focus (Table 2).

Table 2
Research on children's use of the Internet, by main research theme and empirical base

Research theme	Nature of empirical base for supporting claims		
	<i>Includes research with children</i>	<i>Includes research with adults only</i>	<i>No significant work with users</i>
Facts and figures of Internet access and time use	12, 31, 32, 56, 77, 84, 85, 90, 99	16, 17, 65, 86, 97, 98	67
Varieties of online activities, uses and experiences	9, 18, 22, 23, 26, 27, 34, 48, 69, 78, 130	45	28, 30, 43, 102, 125
The 'digital divide' – inequalities of gender, ethnicity, class	83, 106, 110, 114, 124	35, 115	13, 41
Relationship to and displacement of older media	19, 104		47
Education, e-learning and the home-school relationship	46, 64, 68, 87, 91, 100, 113		37, 40, 42, 53, 95, 107, 109
Benefits of Internet use (literacy, creativity, communication)	63, 88, 112, 116		38, 44, 50, 81, 93, 119
Dangers of Internet use (pornography, commerce, privacy, isolation)	76	51, 55, 66	10, 14, 25, 49, 74, 75, 103, 117, 121, 128
Domestic youth/media/family culture in general (computers but not specifically Internet)	12, 19, 21, 36, 54, 58, 59, 60, 62, 70, 71, 101, 108, 126, 127, 129		15, 29, 33, 39, 79, 80, 82, 89, 92, 94, 96
Public/policy discourses on childhood/technology		7	24, 57, 61, 72, 73, 105, 111, 118, 120

Note: this table is intended merely to indicate the main focus of each article, in order to reveal the balance of work conducted and as a guide to the bibliography.

Table 2 shows the research conducted thus far to include particular areas of concentration and neglect.

- Research on the facts and figures of children's Internet use is only slightly more likely to ask children about their access and use directly as it is to ask their parents to report on their children's use. Few quantitative studies survey both children and parents.
- It is still the case that a fair number of research projects focus on 'new media' or 'computer-based media' without paying attention to the Internet in particular.
- For an understanding of the nature of Internet use, research has appropriately turned to working with children themselves. However, articles on the implications of use (for education, benefits, dangers etc) are still more likely to work without obtaining original empirical data. There remains, therefore, a gulf between the largely descriptive studies of use and arguments about the implications of use, these tending to lack an empirical base.

- Few themes have received sufficient research attention such that one can derive solid or uncontroversial conclusions, and few have taken the enquiry beyond initial scoping of the field to resolve deeper or more complex questions.

Drawing together studies of children's Internet use, the consequences of that use, and the policy implications that therefore arise, remains a challenge for the field. Still, one may ask, what do all these studies tell us? Research addressing six key themes is discussed in what follows.

1 Growing access to the Internet

Rapid change. Just a few years ago, the Internet was barely understood, hardly used by the majority of the UK population [129]. Its diffusion through society has been one of the most rapid of all ICTs, as is evident by the speed with which access figures become out of date.

Most significantly, by the turn of the twenty-first century, the Internet has ceased to be a medium for the privileged 'early adopters', and now has reached the mass market. Its arrival in the home is now incorporated within wider social trends towards the privatised, media-rich home and the individualisation and commercialisation of leisure more generally [130].

- In 2001, 2 in 3 UK households had a computer [86] and 30% of UK adults had home access to the Internet [16]; this continues to grow [67].
- Most international surveys show that figures for the USA are 'ahead' of the UK, while the UK remains somewhat ahead of most of Europe except the Nordic countries.

ICT pioneers. Among households with children, access is more common, making young people 'pioneers' of new media cultures [108, see also 99].

- By 2000, nearly 3 in 4 children had a computer at home and of these, two thirds had Internet access also [56]. To put it another way, among 7-16 year olds, 1 in 2 have Internet at home. Furthermore, most have access – to a greater or lesser degree – at school¹⁴.
- Overall, more children use the Internet in school (57% of all 7-14 year olds) than at home (42%), while one fifth use it at a friend's or relative's house.¹⁵ Given access across several locations, the result is that among 7-16 year olds, 75% have used Internet. This contrasts with 38% adults.¹⁶

Digital divide. Figures for both access to, and use of, the Internet remain heavily stratified. Research is now examining the complex interrelations among economic, cultural and social resources in households¹⁷ [13].

- In addition to the continuing and significant inequalities by socio-economic status [12, 21], it appears that young adults use the Internet more than older adults [16], while two-parent families have more access than single parents [17].

¹⁴ See ONS survey of 53,000 pupils across England, Wales and N. Ireland. <http://censusatschool.ntu.ac.uk/table2-1.asp> (last checked Autumn 2001). Also, *Survey of Information and Communications Technology in Schools, England*. (2000). DfEE.

¹⁵ www.bmrbrb-interactive.co.uk 'Internet Use Amongst Kids'.

¹⁶ As shown by both BMRB's TGI and NOP's Kids.net (*op cit*). Youth TGI Spring 2001 showed that 75% of 11-19 year olds have used the Internet. By Autumn 2001 this reached 80%, with an SES bias but barely a gender bias.

¹⁷ These resources may be thought of, by analogy with economic capital, as forms of social and cultural 'capital' (Bourdieu, 1984; Putnam, 2000).

- Little research as yet has explored the reasons why some are low or ambivalent users of the Internet [though see 106].¹⁸

While the 'digital divide' in access is clear, the digital divide in use remains controversial (Compaine, 2001). Some research suggests that given access, disadvantaged groups make equivalent use of ICT [e.g. 86]; others suggest inequalities in use are even more subtle and difficult to resolve than those of access [13, 36, 71, 100] (see section 3, below).

2 On the emerging nature of Internet use

Rapid change is in some ways exhilarating, but it is also demanding to adapt to and to live with. Research is now turning to an exploration of the nature, as well as the extent, of Internet use.

Popular uses. The Internet is used in a variety of ways. Numerous surveys list children's major uses of the Internet, including lists of sites most commonly visited.

- Children claim to value the Internet for providing information, entertainment, and relieving boredom [9, 70, 97]. BMRB's Youth TGI, for example, showed in 2001 that the most common uses are studying/homework (73%), email (59%), playing games (38%), chat sites (32%) and hobbies and interests (31%).
- They use the Internet for diverse purposes – to support schoolwork, to search for information, to play games and, their most preferred activity, for communication (chat, email, instant message) [e.g. 55, 69, 99, 132]. Few yet use it for shopping [86, 99], though it is noteworthy that UK children particularly value and seek out 'Americanised' (i.e. commercial, global brands) websites [8].
- Language matters: a survey in Germany [31] finds that while children use the Internet in a wide range of ways, the lack of German language online services restricts their use, particularly for young children, and thus Internet use remains a small proportion of their leisure time as yet. Of course, children can chat in any language, adding to the popularity of this activity.
- In America – where the Internet has been established rather longer and where language is not an issue - research argues that the Internet now plays a pivotal role in the social life of teenagers, including serious as well as flirtatious or frivolous uses of online communication [88].

The wired home. In going beyond lists of popular uses, qualitative research has focused on the impact on the temporal and spatial structures of the home. The introduction of the Internet into the home raises a series of issues for families regarding its location, use and consequences [12, 26, 114, 130].

- Parents are evolving strategies to manage the Internet within the home. These centre on their educational hopes for it [18]; meanwhile kids prefer entertainment, centred on fandom [18], pop music and bands [22] etc.
- A number of studies observe that children or teens play a key role in acquiring and using the Internet at home [48], even taking on the responsibility of explaining it to their parents, given many parents' lack of confidence in its use [49, 101].
- Becoming the computer or Internet expert at home offers children practical and symbolic advantages within the family, although the nature of such expertise should not be taken for granted [36], for children are not always as expert as supposed [82, 105].

¹⁸ For research on adults, see also Sally Wyatt (1999). They came, they surfed, they went back to the beach: why some people stop using the Internet. <http://virtualsociety.sbs.ox.ac.uk/>

Broadly speaking, the nature of children's meaningful engagement with the communicative and information contents of the Internet remains to be explored. In this, it contrasts with, and should now draw on, the extensive literature on how people engage with the meanings of television (Livingstone, 1998). In the field thus far, textual analyses of content are rarely combined with user studies of the interpretation of online content, repeating the early mistakes of television studies in assuming that content is understood by audiences just as it was meant to be understood. For example, researchers are now defining interactivity [57, 125], but this is yet to be applied in user-based research. Similarly, more work is needed to understand the attraction of computer games, although such work is beginning to take children's experience of games and interactivity seriously [39]

Several lines of research on children's engagement with online content are being developed.

- *Production*. One project examining the Internet as a source of creativity, focusing on the activities of three young web authors [23], found that children can be sophisticated in the skills they bring to bear, but less than creative in their purposes, preferring to mediate the work of others than to express themselves creatively. This suggests that bringing out children's creativity requires more than simply providing them with the tools of content creation.
- *Creativity*. A textual analysis of content produced by children [28] confirms that while children are motivated to produce online content, they tend to do so according to social norms already established offline [102]. This balance between creativity and conservatism is not yet resolved, however, for it is also evident that online communication uses playful language and experiments with identity [119; Danet, 2001; Crystal, 2001], this being precisely what young people value.
- *Hacking*. One study speculates about hackers, arguably the most creative of users [29]; but despite some romantic speculation that it is here that people can resist dominant cultural forms, empirical data are lacking. One study suggests that boys who become hackers develop advanced web skills, learning more about the Internet through informal use than through school; but the empirical base here is restricted to the author's son, so more research is needed. [30]
- *Identity*. While few children become hackers, many are using the Internet for identity play. Taking a somewhat celebratory approach to the potential of the Internet, one well-known American project [34] shows how children use the computer screen to project images of the self, particularly when experimenting with themes of sexuality, politics and identity, thereby generating a 'culture of simulation' [see also 93, 98, 102]. For many, the Internet offers a comparatively safe place for children to experiment with multiple aspects of identity, while games teach children to act in relation to complex systems. More generally, the importance to children and, especially, teenagers, of experiences of privacy, play and even subversion remains to be explored.
- *Communication*. An emerging consensus is that the early, popular opposition between online and offline, or virtual and real communication or relationships is inappropriate. Rather, young people use both on and offline communication to sustain their social networks, moving freely between different communication forms, using the online to forge offline relationships and vice versa [45, 102, 108]. The implication is that most contacts are local rather than distant (or 'virtual'), though research supporting this claim is largely qualitative [although see 132]. Despite the findings of the HomeNet project [51], the consensus is that for all but the already-isolated, the Internet supports rather than undermines existing social contacts [e.g. 99, 112].

In short, use of the Internet, like that of other media, offers a far-from-dramatic transformation of children's lives. Rather, it shapes and is shaped by the practices and routines of everyday life [12, 21, 48]. As a consequence, media culture, youth culture, consumer culture are increasingly intertwined [19, 92, 108], creating generation gaps and gender differences in everyday culture [19].

3 Not all children are the same

While the adult population is generally discussed in terms of demographic differences – gender, class, ethnicity – each of which is associated with inequalities, the category of children is too easily defined purely in terms of age, and so treated as homogeneous. But, children are also divided by gender, class, ethnicity, as well as differing on many other dimensions [73, 77, 90, 108, 126, 130]. One Belgian study divides families into traditional, intermediate and mediated, but finds it difficult to establish whether this typology predicts children's use of, or parental control over, the Internet [48].

It is clear, however, that simply providing access to the Internet is insufficient. A range of inequalities in use are becoming evident [18] and, as noted in section 1, there is some evidence that provision of ICT at home may increase rather than decrease inequalities in class, gender and ethnicity [100, 110].

- *Socio-economic status.* In the USA, survey data show the digital divide persists for both class and ethnicity [27], and similar inequalities exist in the UK¹⁹. Although children in poorer households are less likely to have a computer or Internet access, among those who do, their parents (and they themselves) are more likely to regard the children as the expert, in charge of the technology [21, 60]. Whether this is empowering, or whether it means children lose out on the support middle-class parents can provide remains to be seen.
- *Gender.* Within the home, gender is a comparatively well-researched site of inequalities. While there appear to be few gender differences in motivation for using the Internet, there are considerable differences in the experience of use [9, 21, 32]. As the home becomes increasingly a site of leisure for boys, it appears that boys may control their sisters' access to ICT in order to express, and so reproduce, their masculine identity [83; see also 114 on how fathers are threatened by their sons' expertise with computers, and 115 on how women collude in constructing the computer as 'male territory' within the home].
- *Ethnicity.* A series of household surveys in the USA in the late 90s suggest that the digital divide in ethnicity is growing rather than decreasing although, given access, the gaps in actual use are closing [35]. Arguably, inequalities at home are more problematic than those at school, being more inaccessible to policy intervention.
- *Prior experience.* Once the Internet has been acquired at home, it is less income or parental education than parental lifestyle and beliefs about the Internet that predicts going online [26]. Similarly, those already comfortable with computers transfer their interests to the Internet more readily [9].
- *Solutions?* Those involved in projects to bridge the digital divide in use are finding that tailored online content, plus sustained technical support and training relevant to the target group, are both crucial [41]. One German study offers the tantalising survey finding that more politically active young people are more competent in computer use [32].

In short, access to the Internet is far from egalitarian. A significant minority of young people lack access because their families cannot or are not willing to purchase computer. Factors such as income, cultural resources, gender and age all influence access at home. Most worryingly, the social contexts and values of family life mean that children's use of the Internet may still be patterned in traditional ways, perpetuating or even increasing social divisions within society.

In schools too, the mere presence of ICT in schools is insufficient to transforming the learning process, though the hope is that schools may, potentially, equalise access to ICTs which is unequal at home [87; although see 71]. Critics of the National Grid for Learning²⁰ are concerned that the gap

¹⁹ See UK surveys conducted by BMRB, NOP, Childwise, *op cit*.

²⁰ See *Connecting the learning society: a national grid for learning*. Green paper (1997), DfEE. <http://www.ngfl.gov.uk>

between info-rich and info-poor schools is widening rather than narrowing [40, 110]. Hence, schools face a considerable challenge in devising appropriate use of the Internet within and beyond the curriculum [42], and some interesting initiatives are now emerging to address this challenge [e.g. 91, 124] (see section 5, below).

4 The transition from old to new media

In attempting to understand the significance of ever-newer media, there is a tendency to oppose (unmediated, real) tradition and the (hi-tech, virtual) future [15]. Research systematically argues against such oppositions. Particularly, the evidence over decades of charting the arrival of 'new media' supports two broad principles for the increasingly media-rich environment [130].

- *Displacement?* The first principle is that new media supplement rather than displace older media. The arrival of a greater variety of new media in children's lives is consistently associated with an expansion in media use. Many therefore conclude that, despite fears that newer technologies would displace older ones, these new media supplement rather than displace old media [65, 77, 89, 108, 130].
- As new media enter the mix, the amount of time spent with media appears to be increasing overall. Within the expanding media mix, television continues to dominate [90, 129], although there is some evidence that television viewing is, after all, being displaced [98], this remaining unresolved. Particularly characteristic of young people's leisure is the way in which media are no longer used sequentially but rather simultaneous media use is ever more commonplace. For example, young people use multiple media simultaneously, chatting or texting on their mobile phone while in a chat room or using Instant message [18].
- The argument for displacement of media is largely paralleled for face-to-face communication and other social activities. Here, however, the evidence is less clear-cut, with some evidence of a reduction in time spent on the telephone or in social activities [see 45, 79, 80, 88, 103, 104].
- Second, *remediation*. Here the principle is that when a new medium is introduced into the existing media environment, the uses and meanings of all media are adjusted. The Internet, therefore, can be expected not only to add to the existing mix but also to transform the way in which the television, video recorder, computer games, radio etc are used (Bolter and Grusin, 1999; Marvin, 1988). Familiar textual forms, and well-established practices of television viewing, can be seen to be migrating to computers [47], with children's interests in Internet content being led by their fandom for content from older media [18] – Harry Potter, Nickelodeon, Cartoon-Network. Having now gained access to such content online suggests that both these contents and their reception using older media are in likely to undergo change in turn.

Thus far, studies seeking to contextualise new media in relation to the broader media and leisure environment have not yet included the Internet in their research [12, 19, 21, 58], and very few adopt the longitudinal method required to establish changes in media or social activities over time.

5 Education, e-learning and the home-school link

Today's children comprise the first generation to live in an ICT-rich environment [64]. It is widely observed that parents buy computers to benefit their children's education and then children use them to play games [e.g. 80, 84, 101, 113].

- *Improving education?* Intriguingly, there is little direct evidence evaluating the widespread claim – made by governments and industry, and believed in by parents but perhaps not always teachers – that the Internet will benefit children's education. One study [100] does show that having a computer at home improves test scores, especially for middle class children, thereby increasing rather than decreasing inequalities (as the Knowledge Gap thesis predicts ; Ettema, 1983; Suess, 2001). Some have put the counter-argument forcefully [53, 75], arguing that computers pose health hazards, developmental problems, stunt the imagination, isolate children from the adult world and so forth, although little evidence is cited in support of this alternative view or and none has shown that ICTs undermine traditional learning.
- *Parents' perspective.* Given the equivocal nature of research conclusions here, it is unsurprising that parents are themselves conflicted about the value of computers and, in some ways also, they are in conflict with their children. This conflict centres on the potential educational value on computers, and so on the importance of using 'educational' applications [58, 105]. On the one hand, they can see children are becoming the experts, confident learners in this new information age; on the other hand, they worry about the loss of traditional skills and competencies, together with the values they represent.
- *Children's experience.* Research on children's use of online educational resources does not yet tell a consensual story. Computer use as experienced by children is strongly about mastery, potentially even about finding personal paths to learning or about evolving new kinds of learning cultures [46]. Yet, children have been shown to find it difficult to use online library resources, finding the process of searching, using keywords ineffectively, though this is only partly a matter of training and partly a matter of interface design [37]; research on children's searching online finds that many of the same difficulties apply at home [18, 105].
- *Contrasting uses at home and school.* A common theme across the literature is the way in which computers and the Internet are used differently at home and at school [42, 59, 77, 78, 84]. The difference is not simply that children prefer to play games at home while at school they word process or use data bases. It is also that different styles of use, or different forms of competence, are being developed through use in these different locations. It is still unclear whether the computer is best thought of as a tool or as a toy? [59] Or, whether play is part of, or opposed to, learning? [101, 111]
- The *uncertain pedagogy* of the computer [72, 109] makes policies centred on an effective home-school link particularly fraught [105]. Some argue that this itself is caused by a technological generation gap [62]. At school, children's use of computers is closely supervised, at home parents supervise rather little [78], and children make much greater use of computers and the Internet at home [e.g. 59, 84, 87]. This freer exploration at home means that school competence lags behind that of the home [46], though there is a danger that at home parents try to impose their own – now dated – learning styles on today's children [46].
- *Parental responsibility.* If ICT at home is meant to complement or compensate for the deficiencies of learning in school, this raises questions about the changing role of parents [73]. Particularly, this responsibility can become a burden on mothers, potentially causing some problems as it resolves others [71]. Significantly, if unsurprisingly, young people claim to learn about ICT more from their friends than from either parents or school [32].
- *Transformations in literacy?* Some argue that, by representing knowledge in a different manner from that of the traditionally-valued book (i.e. multimodal, hypertextual, heterarchical, diverse), ICTs are transforming notions of literacy, authority, knowledge, creativity [62, 64, 95, 105, 107, 109, 130]. Literacy is, of course, a source of social power, raising questions about the cultural value, institutional support and policy intentions in relation to new and emerging conceptions of literacy. Children are 'learning to learn' when they search for and evaluate information rather than memorise a canonical set of facts, using creative experimentation and exploration rather than right-answer learning.

- *Policy implications.* On this view, the key to facilitating children's learning is precisely not to extend school-based learning into the home but rather to extend informal, playful learning processes from the home to the school [54, 60, 64, 68, 109]. This is particularly important as children without a computer at home lack these opportunities for exploration [84]. How this does, and could, work (in terms of curricula, teacher training, etc), remains to be specified, as does an effective evaluation of whether it actually does work. There is some evidence for an improvement in specific cognitive skills after playing computer games [79, 80, 94], though long-term studies are lacking.

6 Evidence to inform policy: the risks and opportunities of Internet use

Risks

Defining risk. Definitions of 'risk' are value-laden. For example, while some worry about commercial exploitation of children online [103], others are exploring ways of encouraging children to use online financial services [69, 70]. Similarly, while anonymity and play, even deception, in communication can be vital to childhood [22], this gives rise to some fears for their safety.

Of the three categories of danger online which Childnet International identifies [14], most work has concentrated on content, there remains little as yet on contact, and still less on commerce. Some potential dangers – such as gambling [85] are barely researched from the users' perspective.

- *Content.* How far pornography poses a real problem on the Internet remains disputed [10]. Studies mapping the incidence of pornography on the Internet find much material which is upsetting or embarrassing for children [25]. In terms of actual risks, a Canadian survey of parents suggests 1 in 5 children have found undesirable sexual material online [55]. Such estimates vary widely, partly because – as some surveys have found – only a minority of children tells a parent or teacher if they do find such material [105]. The Kaiser Family Foundation survey of teens finds that one in three have seen pornography online [27]. It also finds that children are more likely than adults to trust online information [27], indeed they appear generally uncritical of motivations for providing online resources [105, 132].
- In the UK, reliable survey findings are yet to be collected, though one schools-based survey finds that 1 in 3 children chat to unknown people while as many as 3 in 4 have found upsetting material [76]. NOP's kids.net survey [132] found that up to a quarter of children aged 7-16 may have been upset by online materials, and few reported this to an adult. Figures for how often parents check on their children's Internet use [88] are higher in the USA than in the UK, suggesting either a greater level of anxiety or, more likely, a more established culture of Internet use.
- *Contact.* The key group at risk, according to the Chatwise Streetwise report [117] is girls aged 13-17, requiring a series of policy interventions. The Pew Internet and American Life Project surveyed 12-17 year olds in December 2000, finding that nearly 60% of those online had received messages (of any kind) from strangers [87, 88].²¹ The *Chatwise, Streetwise* Report [117] suggests that incidents of adult sex offenders meeting children online and gaining their trust are increasing in both the UK and USA [see also 121].²² NOP's Kids.net survey in the UK suggests that 29% of children using the Internet might give out their home address and 14% their email address. Beyond such opinion polls, however, little published research has explored the question of unwanted sexual contact through online communication.

²¹ *Teenage Life Online* (6/01) http://www.pewinternet.org/reports/pdfs/PIP_Teens_Report.pdf.

²² Indeed, there has been a steady stream of convictions involving abusing children online (See <http://www.chatdanger.com/setframe.html> and <http://www.childnet-int.org/publicat/sydney.html>). Recommendations in the *Chat Wise, Street Wise* Report (<http://www.internetcrimeforum.org.uk/>) have been followed up in the Expert Workshop, 'Protecting the online generation', DTI 6/7/01. See also, 'Challenges of the Internet', by the European Research into Consumer Affairs, <http://www.net-consumers.org/erica/safer.htm>.

- *Commerce.* There is increasing concern over whether children's rights to privacy are violated by online advertising, particularly those making use of unfair or deceptive practices [24]. The Center for Media Education identifies new forms of online marketing practices targeted at children, including 'branded communities', 'viral marketing', and so forth [74, 103, 128]. Their analysis of popular teen websites finds that most collect personal information and encourage sales. Little research, however, has investigated such techniques from the user's point of view to discover how teens respond to such sites and whether they can recognise and/or distance themselves from an approach. Particularly of concern to the CME, and others, is the pressure towards the formation of alliances between civic sites and commercial ventures.
- *Parental views.* Parental concerns over media now centre on the Internet [65], particularly in relation to values, commercialism, privacy and, most of all, sexual material [66, 98]. Interestingly, parental views of the Internet are not stratified by education or income but rather depend on prior experience of the Internet, generally at work [66]. Three quarters of parents worry that their children will give out personal information on the Internet [26]. Those aspects of the Internet children most value – its openness and interactivity – are precisely those that most worry parents [26], though estimates of parental concern vary [e.g. 97].
- *Domestic regulation.* Many argue that filtering and other technical solutions to the potential harms of the Internet are insufficient and cannot replace parental guidance [e.g. 49]; yet this results in the problem that many parents lack confidence and/or understanding in guiding their children [49]. Parents are developing rules for managing their children's use of the Internet. These appear to be more or less common, partly depending on how the questions are asked, and may be more or less effective [55, 27, 76, 88, 105].
- *National regulation.* While policy makers are debating various forms of self-regulation for the Internet [118, 120], it would appear that governments hope to devolve responsibility to parents. Indeed it seems that the harder media get to regulate nationally or internationally, the more parents are expected to step in and fill the regulatory gap. However, it is clear that parents want a collaborative approach to regulation. They accept their responsibility for the technology they have brought into the home but consider themselves ill-equipped to regulate this effectively within the home [55] and so hope for regulation at a national level [e.g. 99, 105].²³

Can one conclude that harm being done? No, for most importantly, there is little or no direct research on the harmful consequences of Internet use. As pointed out in the discussion of methodological challenges, above, it should be borne in mind that the link between risks, incidents, and actual harm is genuinely tenuous. Not all risks taken result in worrying incidents, and not all incidents result in actual or lasting harm. Whether one can even research what children have seen, whether it upset them, and what it meant to them, is dubious in both ethical and practical terms. Beyond the mounting evidence of actual crimes in the criminal statistics,²⁴ there is little research on the extent of risky behaviour or harmful consequences across the population of children and young people as a whole. Moreover,

²³ At European level, the EU's Action Plan on Promoting Safer Use of the Internet is funding a variety of initiatives and pilot projects across Europe to promote education and awareness (1999-2002); see www.europa.eu.int/ISPO/iap/index.html and <http://www.saferinternet.org/awareness/projects.asp>. Elsewhere, other public awareness campaigns include America Links up (www.getnetwise.org/americalinksup), <http://www.ram.net.au/NetAlert/netalert.html> in Australia and www.pagi.org.sg in Singapore.

²⁴ There has been a steady stream of convictions involving abusing children online (See <http://www.chatdanger.com/setframe.html> and <http://www.childnet-int.org/publicat/sydney.html>). Recommendations in the *Chat Wise, Street Wise* Report [117] (<http://www.internetcrimeforum.org.uk/>) have been followed up in the Expert Workshop, 'Protecting the online generation', DTI 6/7/01. See also, 'Challenges of the Internet', by the European Research into Consumer Affairs, <http://www.net-consumers.org/erica/safer.htm>.

while there are a number of initiatives now attempting to increase children's safety awareness (and that of parents), none has yet been evaluated for its effectiveness through rigorous research.²⁵

Opportunities

Notwithstanding the hype surrounding the Internet, too little discussion exists mapping out the value, potential or actual, of the Internet to children and young people. Children remain vague about the value of the internet [22], as do adults [18]. We have already considered some research on benefits, namely:

- *creative content production* (section 2);
- *the identity and relational benefits of online communication* (section 2);
- *the educational benefits of Internet use in school and home* (section 5).

In addition, research is pursuing the following opportunities to which the Internet gives rise.

- *Public culture.* Research on children and television has been used to develop an equivalent vision of opportunities in relation to the Internet. Specifically, the Children's Television Charter argues for children's rights to expression, creativity, literacy, participation etc, all of which could be expected of the online environment also [38, 105]. Other research is beginning to map websites for children to identify where the interesting opportunities lie in Internet content [44, 81, 93, 103]. This assumes some 'public service ethic' on the world wide web, to see the web as a space for shared or communal expression, and especially to value of children's self-expression through content production. This is particularly being explored through girls' identity expression in this hitherto 'masculine' hi-tech medium. One project examined how teenage girls may use the Internet as a source of health information [116]. Another mapped kids' websites [44] notes that while the various kinds of sites – web guides, web communities, clubs and organisations, commercial and media websites – offer some participation, this is often restricted in scope and tightly controlled.
- *Participation.* The few studies charting interesting initiatives involving young people's participation through using the Internet [e.g. 43] hold out the promise for new opportunities, but generally remain at the level of the interesting example, or the instance of best practice, but how these can be evaluated, or implemented more widely, remains unresearched. The Center for Media Education in the USA is prominent among those arguing for the public policy potential for creating a 'youth civic media' online, including children creating their own content [50]. Through their survey of websites, encompassing a range of public and private initiatives, the CME hope not only to identify inspiring opportunities but also to demonstrate the economic viability of such initiatives. In the UK, as citizenship education formally enters the National Curriculum, the question of citizenship mediated by the Internet becomes especially crucial for children, for they are frequently excluded from other forms of civic participation (through work, community organisations, the electoral system, etc).

Balancing risks and opportunities

Getting the balance right between opportunities and dangers is not easy. In regulating children's Internet use, we risk two failures – the failure to take up opportunities, and the failure to protect against dangers. Qualitative research suggests that parental fears of the risks – whether technical, sexual or commercial – resulting in children fearful of, or not allowed to, download files, use email, answer dialog boxes, use file attachments, go to chat rooms, etc. [105].

²⁵ Possible models for safety awareness training – not yet formally evaluated – include www.safekids.com, www.scotland.gov.uk/clickthinking and GridClub (www.gridclub.com), co-funded by Channel 4, a fun, password-protected educational website/chatroom for 7-11 year-olds. See also www.becta.org.uk and the surfing proficiency certificate advocated in [105].

Balancing positive and negative effects of the Internet remains disputed [63], producing a Jekyll and Hyde image of the medium [66]. There is a consensus among the academic community, by contrast with that among policy circles, that the stress on dangers is biasing the policy agenda away from a constructive exploration of the benefits of the Internet [7]. For example, it is noted that there is a bias towards protecting children from pornography rather than protecting their privacy [7, 103].

For this reason, one series of studies focuses not on children's use of the Internet but on how society understands their use, analysing the public discourses of childhood and technology [e.g. 7, 15, 61, 73, 111]. Childhood is not a natural category but a historical and social construct [33], the implication being that research questions relating childhood to the Internet must be scrutinised for their implicit values and assumptions. Otherwise, policy may be led more by myths of childhood [e.g. of the expert 'cyberkid'; 106] than a knowledge of what might actually support children's Internet use. Certainly we must move the debate on from futile oppositions between optimists and pessimists, technophobes and technophiles [30, 33].

Towards a research agenda for children's use of the Internet

Although at present the number of projects that have been or are being conducted in the UK is modest, there are many pressing questions for the research agenda. In the above discussion, the following areas have been identified as particularly meriting research attention in the coming months and years.

A thin empirical base. While much has been learned, as the body of this review shows, the relative immaturity of the research field at present is revealed through its methodological choices, though these also, of course, reflect the funding available. Many of the empirical research projects thus far have the character of pilot rather than fully-fledged studies. Too often, empirical material is thin, and some is merely anecdotal. Samples are convenience rather than systematically drawn. More research focuses on what leads people to use the Internet (their motivations, their social group) or on how they use it (when, where, for how long, with whom), than on its impacts or consequences (benefits, harms, outcomes). Little is known yet about the web contents available for children, and still less about how these are used by children.

Independent sources of funding. In the context of the UK, it appears easier to raise issues (and to raise funding to explore issues) using small-scale qualitative work than it is to examine the distribution of (or inequalities in) usage patterns through representative surveys. Thus for the UK, quantitative data on Internet use are either provided by commercial bodies (in which case they are both expensive and lack depth or context) or by academic research (in which case underfunding means they tend to use weak sampling techniques). In this respect, there is a striking contrast with the USA, where universities such as Stanford, UCLA, Pennsylvania and foundations such as Pew provide independent, representative surveys, often conducted on an annual basis. The UK has no such sources of data, this being a significant gap.

The extent of access and use. Quantitative survey research, conducted by independent bodies, is particularly needed to obtain frequency estimates of any activity and an assessment of the extent to which activities vary by age, gender, socioeconomic status, etc. As present, quantitative research exists produces 'headline' findings but suffers some significant flaws. Notably, surveys are needed which pursue several ways of asking difficult questions (e.g. about pornography or other harms), which collect contextual information (for example, breaking down types of use by location of use), and which provides information on social inequalities or digital divides (ethnicity is generally neglected, and some surveys also fail to break down findings by socioeconomic status). Government statistics do seek evidence of inequalities, but too often address adults or households rather than children as a population.

Pursing questions of inequality. This review has raised a series of key issues regarding the digital divide, for which more research is needed. How far is it the case that the digital divide is becoming one of use rather than access, so that simply providing ICT access will no longer suffice? Are the same sources of inequality (especially socioeconomic status) still the main ones, or are others (gender, ethnicity) also important? How can parents best be supported in taking on the role of creating the home as an informal learning environment? Can the school redress inequalities or is it rather perpetuating them? Are well-meaning initiatives resulting in a growing rather than diminishing divide? Do children without Internet access at home suffer a new form of social and educational exclusion?

Pursing questions of literacy and competence. It remains unclear how far there is a generation gap in ICT competence? Are children as expert as they seem? What does this 'expertise' consist of and how can it be fostered? What kinds of new literacies are being developed through play, which should be developed by the school and should the learning environment at school change to follow the practices of exploration at home? Are children turning away from traditional sources of knowledge? What do children understand of the particularities of the computer interface, including its guidance, help systems, its risks and commercial exploitation? Do these new sources of competence actually support children's educational attainment or is this outweighed by the negative or harmful consequences, if any?

The changing home. Qualitative research is raising many of interesting and significant research questions, some of which should now be pursued in quantitative terms but many of which require further qualitative investigation. Overall, research suggests that for children and young people in the UK, the home is becoming the site of content production as well as reception, and of education and work as well as entertainment and leisure. This raises new questions about the links between children's different activities, as learning becomes fun, as play may (or may not) be educational, as online chat may 'count' as civic participation or may rather represent a withdrawal from community. It also raises new questions regarding the links between the institutions that regulate these activities. Of particular importance is the challenge of making the link between home and school work, of managing new styles of informal and lifelong learning, and of clarifying the lines of responsibility between parents and the state in facilitating opportunities and preventing dangers resulting from Internet use.

Engaging with online contents. Research must now bring together the few studies of the nature of online content available to children with studies of the domestic contexts for Internet use. In the centre of this interaction, but too little examined thus far, is how children engage with these contents. For example, do they use the global resources of the web or access mainly UK-based resources? Are they taken in by, or critical of, the various forms of misinformation online? How are social networks and peer culture changing as online communication becomes more commonplace? Can the Internet provide an opportunity for children's creativity in producing content? What is the emerging balance between the benefits, and the risks, of unsupervised identity play and online community-building? How does use of the Internet impact on, or transform, children's use of other media?

Evidence-based policy? There is currently a considerable gap between the theoretical and policy discussions, which often appear unaware of the thin empirical base on which their claims rest, and the empirical literature, which is too often descriptive, using common-sense rather than theoretical terms to characterise Internet use. Moreover, while it is easier to critique policy than to produce evidence to guide its choices, independent analyses of policy are also thin on the ground. More specifically, while policy makers may wonder whether, for example, parents or children read content labels or read privacy policies or notice online advertising, little or no such research (available in the public domain) has examined such questions. Little also is known of parental practices regarding safety, either social (providing guidance, discussing dangers) or technical (installing filters, checking the history), nor of children's practices in following or evading such rules [although see 132 for some indicative data].

To pursue each and any of these topics and questions must surely benefit children and young people in the years to come.

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