SAILING INTO UNCHARTED WATERS – THE IMPACT OF NEW MEDIA USE ON EDUCATION

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Abstract
In the course of the last decade, media consumption patterns among young people have changed markedly. A substantial proportion of teenagers and young adults in industrialised countries now have access to and make use of computers, the Internet, games consoles and mobile devices in addition to "old" media such as television and radio. The hypothesis in this paper is that out-of-school media use has an impact on the cognitive and affective development of our students and therefore has implications for educational policy and practice.

The first section addresses the terms "media" and "media consumption" and illustrates current use of media by teenagers and young adults. Research findings on media consumption – with games as an example - provide us with cues about the cognitive, affective, cultural and social consequences of out-of-school media use.

The second section analyses changes in the supply of electronic media from a macro-economic perspective and looks at forecasts for the near to medium future. As a consequence, we can expect that changes in the media consumption of our students will continue.

The third section attempts to show how we can make use of research on media supply and media consumption to help plan the use of information and communication technologies for teaching and learning in education.

Introduction

For more than a decade, public authorities have been formulating and implementing policies and programmes to promote the effective use of information and communication technologies (ICT) in education. In the course of that same period, the computer and the Internet have made their appearance in the home and are on their way to becoming mainstream media. By and large, national education policies pay little attention to out-of-school use of ICT and its impact on education. The only exception appears to be concerns about social polarisation as the result of the digital divide and the provision of universal access to the Internet in education.

In this paper I hope to provide arguments and evidence that out-of-school media use has an impact on the cognitive and affective composition of our students and that these changes have implications for education policy and practice.

Media Consumption

In the first section I would like to discuss the terms "media" and "media consumption". Until recently, the term media has often been synonymous with broadcast media, neglecting the printed word. Media consumption is measured in both in terms of time and money - the number of hours spent watching TV or listening to radio, and per capita or household spending on media. This narrow interpretation, focusing on broadcast media, is now being questioned.

Bourne (2002) has recently argued that "media consumption is moving from a purely broadcast environment into a more personalised, interactive one. Measuring total growth and share of media expenditure, even if some categories are not yet directly competitive, is a way of understanding how the values that individuals put on different platforms are changing as a result". For this reason, he has grouped media usage into three categories:

- **Watching** – a physically passive style of media consumption covering television and time-shifted viewing, VHS and DVD, Pay Per View and Video On Demand
- **Playing** – a more active type of media generally bought in units rather than subscriptions and including console games and recorded music
- **Connecting** – usage involving peer-to-peer or peer to group communication and information covering mobile phones, e-mail, the Web and services such as ICQ and MSN Messenger

The categories themselves have rather blurred boundaries. What Bourne finds important, however, is that all kinds of media consumption fit within these three categories.

As can be seen from Table 1 that covers the United States, watching television was the dominant media activity throughout the nineties. Playing (covering console games and recorded music increased in the period and connecting (using the Internet) also grew from an initially small figure.

Note that reading of all kinds declined in the same period:

Item	Consumption in 1992 (hours per annum)	Consumption in 2000 (hours per annum)	Change in the period 1992-2000 (%)
TV	1,510	1,571	4
Radio	1,150	1,056	-8
Recorded music	233	269	15
Newspaper.	172	154	-10
Books	100	96	-4
Magazines	85	80	-6
Home video	42	55	30
Video games	19	43	126
Internet	2	43	2.050
Total	3,324	3,380	1,7%

Source: Lyman (2000)

Table 1: Summary of yearly media usage by US population 1992 and 2000. All categories 18 years and above except video games (12 years and above)

Lyle's figures are for the adult population, generally speaking those who are over 18, with the exception of console games, where the threshold is 12. If the focus is on changes in media consumption among those entering university, we need to be able to tabulate and analyse data by gender and sex and track changes over time.

In Table 2, Brown (2002) using a combination of statistics from the Federal Statistical Bureau and marketing studies of console games argues that the demographic profile of games players has, indeed, changed since 1980.

Whereas the target audience then comprised 10-20 year-old males, the appeal of games over the last two decades has broadened both in terms of gender and age:

Males (thousands)					Females (thousands)				
Age groups	1980	1990	2000	2005 (est.)	Age groups	1980	1990	2000	2005 (est.)
60-65	4,552	4,948	5,087	6,762	60-65	5,309	5,671	5,670	6,086
55-59	5,361	5,004	6,461	8,741	55-59	6,024	5,470	6,992	8,101
50-54	5,616	5,521	8,577	10,082	50-54	6,136	5,848	9,049	9,578
45-49	5,428	6,779	9,856	**11,264**	45-49	5,765	7,045	10,202	10,965
40-44	5,592	9,780	11,293	**11,412**	40-44	5,850	9,014	11,473	11,222
35-39	6,640	9,904	**10,956**	**10,155**	35-39	6,890	10,078	11,087	**9,927**
30-34	8,260	10,905	**9,674**	**9,436**	30-34	8,476	11,008	9,890	**9,146**

25-29	9,499	**10,658**	**8,769**	**9,207**	25-29	9,632	10,578	**8,855**	**9,144**
20-24	10,515	**9,746**	**9,531**	**9,889**	20-24	10,532	9,389	**9,162**	**10,269**
15-19	**10,886**	**9,113**	**10,226**	**10,202**	15-19	10,609	**8,652**	**9,668**	**10,788**
10-14	**9,484**	**8,810**	**10,252**	**10,069**	10-14	9,101	**8,388**	**9,765**	**10,654**
5-9	8,822	9,246	**10,070**	**9,348**	5-9	8,431	8,816	**9,611**	**9,774**
0-4	9,980	9,648	9,682	9,397	0-4	9,530	9,205	9,263	9,815

Sources: Brown, Alex; Deusche Bank/Census Bureau in Koffler (2002)

Table 2: Consumer demographics of interactive game users in the USA 1980-2005

In 2005 games will be played by a significant proportion of females between 5 and 39 and of males between 5 and 49. Brown claims that the reason for this demographic profile is that the original game players continue to play when they get older; total numbers increase as new cohorts of 5-9 year-olds take up gaming.

Taken together, these two tables show us that media consumption measured in hours per annum has increased. Watching still predominates, whereas playing and connecting have both grown more rapidly, albeit from a smaller base. Brown's figures for console games show that what starts off as a phenomenon for male teenagers can broaden its demographic profile over time.

A number of European countries have experienced changes in media consumption similar to those described for the US. There is the added advantage of having recent figures on media expenditure.

According to Bourne, the monetary spend by the average European has jumped from €282 in 1998 to €496 at the end of 2001. Media spending increased at an annualised rate of 33% for two years from 1998 and currently exceeds 3% of total average consumer expenditure in Europe.

While annual growth rates for expenditure on "watching" remained in single digits, "playing" grew faster. Both growth rates were dwarfed by consumer expenditure on "connecting" platforms such as the Internet and mobile phones.

What does all this mean if we are primarily concerned with those entering tertiary education? Those who were children and teenagers a decade ago are now going to college or university and for this reason data on the media consumption of children and teenagers are a good starting point. We can make use of recent pan-European studies such as Livingstone (2001) and Drotner (2001) for a detailed analysis of media consumption in Denmark. In addition to such academic research, broadcasters have also commissioned studies to determine the reasons for the drop in prime time television viewing by teenagers and young adults in a number of countries in the nineties.

It should be noted that there are limitations associated with all the methods currently used to quantify media consumption in terms of time. Interviews and logbooks suffer from interviewee over or under-reporting. Direct metering systems for television cannot ascertain if the viewer is actually viewing the programme or merely sitting on the sofa reading the newspaper. Ethnographical methods involving a combination of video recordings and subsequent coding are accurate but are not a cost-effective means to generate data for quantitative studies. Even so, when a given interview or metering method is repeated over time, the overall trends are likely to be valid even though individual figures for media consumption need to be interpreted with caution.

To illustrate the changes, I should like to present figures for Denmark.

Which devices do children and teenagers have access to and use?
Drotner's study from Denmark shows that in 1998, when data collection was carried out, the television, video, the phone and CD-player were the most widespread devices in Danish homes. Since the study, mobile phones and computers have joined these devices. All of them are now to be found in at least 70% of all Danish homes.

Children have access to a veritable arsenal of devices and a range of new services that they can use. Among the "old" services that have taken root among the young is teletext (a simple text-based on-line service on television used to access content such as programme guides and news headlines). It has

recently been joined by peer-to-peer communication using SMS messages on mobile phones, e-mail, chatting and instant messaging on the Internet.

The appearance of mobile phones mean that old media are being used in new ways: teenagers in Denmark chat with each other using SMS via teletext, use SMS messages to play virtual fruit machines on television and to participate in polls and video battles in connection with cross-media TV shows for teenagers such as "Banzai", "Boogie" and MTV.

Having access to a device at home is not necessarily an indicator of its use by children and teenagers. Devices used for entertainment – computer games, video consoles, Walkman and Discman as well as Internet access from a PC – are used by a bigger proportion of 9 to 16 year-olds than those who actually have the devices at home.

If an adolescent does not have a computer or video console, he or she often plays at the home of a friend. In 1998, the difference between access at home and use regardless of location was greatest for the Internet (25% had Internet access at home while 45% actually used it). In addition to using the Internet at a friend's home, free Internet access at school or from public libraries has played an important role in compensating for socio-economic differences in Danish society.

How much time they spend on the various media and services using these devices?
Drotner makes a distinction between media on the basis of their function. She divides media consumption into entertainment, information and communication media. As can be seen from the following table, 9-16 year-olds spend more time on electronic media on a daily basis than they do in school:

Activity	Media consumption by users Hours: minutes	Mean media consumption by all 9-16 year-olds Hours: minutes
"Entertainment media"		
Watching television	2:36	2:33
Watching video	0:49	0:44
Watching computer games	0:59	0:45
Playing with video consoles (Playstation, Nintendo etc).	0:48	0:25
Playing Gameboy at home	0:16	0:05
"Other entertainment media"		
Listening to tapes, CD's or records	1:27	1:24
Listening to the radio	0:58	0:43
Reading a cartoon series	0:16	0:11
"Informative media"		
Using a computer – other than playing games	0:26	0:17
Using a computer at home	0:53	0:43
Reading a book (not school books)	0:21	0:17
Reading a magazine	0:13	0:11
Reading a newspaper	0:08	0:05
"Communication media"		
Calling someone on the phone	0:14	0:13
Using the Internet on one's own	0:16	0:10
Using the computer at home	0:53	0:43
		N=1.175

Source: Drotner (2001) page 16-17
Table 3: Summary of media consumption by Danish 9-16 year-olds in 1998

Reading for information or pleasure occupies a surprisingly small part of media consumption. A typical child spends about an hour a day using a computer, which is often considerably more than is the case at school. If one includes playing games and accessing the Internet the figure for computer-related activities is quite substantial. Some of this time comes from a reduction in time watching television and reading.

In 1998, Bourne's category of "watching" was still the biggest of the three for Danish 9-16 year-olds, with "playing" not so far behind. "Connecting" as the fastest-growing category. Media consumption trends among the population at large lag behind those of this age group.

Where do 9-16 year-olds use these devices and for what purpose?
It should be self-evident that mobile devices such as a Walkman, transistor radio, MP3 player, ghetto blaster or mobile phone can be used almost anywhere. Indeed, mobile phones are now so widespread that many institutions have been obliged to introduce regulations governing their use during classes.

As regards the home, a relatively new phenomenon is "the bedroom culture". In the past, the radio and television were social media to be found in the sitting room. In the last decade, consumer electronics have spread within the home.

In an urban world where parents work and road traffic is on the increase, equipping the bedroom with TVs, audio and computer equipment represents an ideal compromise in which children are both entertained and kept safe. In 1998, Four in every five Danish teenagers were reported to have TVs in their bedroom, more than half had a VHS and 55% of boys and 24% of girls had a computer.

As young people spend more time in their own rooms, media become less central to the family but more important among friends, with whom TV is a shared experience. From around the age of 9, children's bedrooms become important to them as a private space and new media especially are welcomed for their entertainment value as well as symbols of status. New means of peer-to-peer communication allow teenagers to switch between face-to-face and virtual communication and sustain new kinds of virtual communities which hinge on shared interests.

Interestingly, the widespread availability of recorded music on CDs, tapes, on MP3 players, on the radio and via the Internet demonstrates one of the key aspects of convergence: media can no longer be defined in terms of the technology or devices used but rather in terms of their form, content and function. In a media consumption study commissioned by DR in 2000, researchers noted that children interviewed had difficulty establishing whether they had been listening to music on the radio, via the Internet or on some other device – the definition of radio in terms of its technology was becoming irrelevant.

As Table 3 reveals, young people use a wide range of media and devices. Other studies show that two or more devices are often used at the same time. Some researchers now distinguish between foreground and background media. The former is the main focus of the person's attention whereas background media provide a neutral, agreeable environment in which to work or have fun.

A survey of the distribution of media consumption over a 24-hour period conducted for DR in 2000 revealed that using the computer (foreground medium) in the afternoon and evening is frequently accompanied by listening to music (background medium). Using a computer and listening are complementary activities, whereas watching television and using a computer at the same time are often mutually exclusive activities.

When comparing out-of-school media use with what goes on in the classroom, the striking difference concerns the duration and nature of use. On average, Danish children use computers more frequently and for more than twice the duration outside school than they do in the classroom. If one includes video and computer games, the use of teletext, peer-to-peer communication by mobile phone and ICQ or MSN Messenger, what happens in school pales in significance.

In qualitative terms, children use ICT for a far broader range of tasks and in a more creative fashion than they do in school.

To what extent are new media replacing mass media and taking time from conventional activities such as sports and hobbies?
Television is still the dominant medium in terms of time spent per day. DR studies since 1998, however, indicate that television consumption for 12-30 year-olds on weekday evenings is falling; on an annual basis the proportion choosing to do something else - often involving a computer - increases by 2-3% annually. Even so, TV still attracts ten times the number of people who use computers in the evenings between 8 and 10 pm.

Livingstone concludes that, at European level, the place of print media in young people's lives is changing, threatened both by IT as a source of information, and television and games as a source of narrative and entertainment. Those with access to a PC are twice as likely to use that as a source of information than those who turn to a book. There are marked gender differences: with the possible exception of girls, most children turn to television or a computer game for their narrative appeal. Books are most positively viewed when the child is interested in a particular type of content, but in general, the book has a poor image. It is widely seen as boring, old-fashioned, frustrating and requiring too much effort. Books are not trendy; they are the sorts of thing "parents approve of".

Drotner (2001) and studies reported in August 2001 indicate increased levels of stress among Danish preschoolers and schoolchildren. An overall increase in media consumption may be a contributing factor to this, in that there is less time for conventional play and social interactions. Given that the vast majority of Danish mothers have a full-time job, concerns about children being left to their own devices when not at school may have reinforced the trend away from unsupervised play outdoors and travel between home and school to "safe" indoor activities in the bedroom.

What is known about the impact of this media consumption on the cognitive, emotional, cultural and social development of children and teenagers?
It would be foolhardy to offer an overview of the substantial research done in this field when there already exist excellent works of this kind such as van Dijk (1999). However, I would like to make a contribution in the field of games, as this seems to be one of the most controversial kinds of media from an educational perspective.

Airline training institutions such as the SAS centre in Copenhagen report that youngsters who have spent time using flight simulators on video consoles appear to have a faster learning curve on full-scale flight simulators than those with no prior experience. It is claimed that there is transfer of hand-eye coordination from console simulators to the real thing.

Watching two of my nephews working for nearly 100 hours on an early CD-ROM version of the FIFA Soccer Manager demonstrated that a kind of "education by stealth" was taking place as they worked their way systematically through the title. What was striking, as was also reported in a recent study by Becta (2002a), is the power of a successful game to motivate. "The software induces conditions within the players which encourage them to continue their involvement with their role as game player. Such conditions include satisfaction, desire, anger, absorption, interest, excitement, enjoyment, pride in achievement, and the (dis)approbation of peers and of others. It is in provoking and harnessing some of these emotions and their consequences that games software might benefit education."

The study goes on to analyse games and motivation in greater detail, to suggest the kinds of learning that can be best supported by games. It also identifies a number of possible drawbacks to the use of such games. A series of presentations and papers from a Becta conference on the subject held on March, 2002 can be found in Becta (2002b).

Kirriemuir (2002) presents an overview of gaming console technology, addressing the benefits they can bring to the learning environment. He discusses costs, network capability, and processing power in relation to the PC before discussing the potential application of games and consoles to teaching and learning, with a particular focus on the developments in functionality of consoles in the near future.

One of the key issues addressed in media research over the last 40 years is the impact of violence in television and more recently in computer and console games: Does the consumption of media containing explicit violence affect the social development of the viewer or player?

There is a wealth of research studies on this topic, but unfortunately many of them seem flawed. Egenfeldt-Nielsen and Heide Smith (2000) in their book and website update (2001) review some 60 scientific studies published in English or European languages. They were unable to draw any general conclusions about negative social behaviour on the basis of this review.

A second widely-quoted review by Goldstein (2000) submitted to a US Senate hearing on games comes to similar conclusions: "Nearly every study suffers from unclear definitions (of violence or aggression), ambiguous measurements (confusing aggressive play with aggressive behaviour) or using questionable

measures of aggression, such as blasts of noise or self-reports of prior aggression) and overgeneralizations from the data… In reality, a game player chooses when and what to play, and enters into a different state of mind than someone who is required to play on demand".

An indication that we still have an incomplete picture of the impact of these media comes from brain and neurophysiological research. In a study reported by McVeigh (2001), Professor Ryuta Kawashima of Japan's Tohoku University found that computer games only stimulate activity in the parts of the brain associated to vision and movement. Kawashima analysed brain activity in children playing Nintendo games and in children engaging in an arithmetic exercise called Kraepelin, which involves adding single-digit numbers continuously for half an hour.

His findings indicated that children who play computer games halt the development process in other key areas of the brain, affecting their ability to control potentially anti-social elements of their behaviour. In contrast to video games, math exercises stimulate brain activity in the left and right hemispheres of the frontal lobe - the area most linked with learning, memory, emotion, and behaviour control.

Another recent study by Koepp M, Gunn R, Lawrence A, et al (1998)   shows that physiological changes associated with learning take place while playing video games. It demonstrated that striatal dopamine release increases during video game playing and that the correlation between dopamine release and performance level was significant. Dopaminergic neurotransmission is probably related to learning, reinforcement behaviour, attention, and psychomotor, hand-eye coordination.

My own sense of the situation from all these studies of games is that well-balanced children in a normal, supportive environment are at very little risk. A cautious position is that, for young children, watching television with an adult or playing computer games with friends would seem to be advisable both to regulate the time spent on these activities and also to mediate the experience and to encourage discussion of what has been experienced. By the age of 7, most children have a clear sense of what is real and what is make-believe. From 7 onwards, learning at different levels of cognition does seem to take place. There would seem potential to harness the motivation of playing games in a formal educational context, as a minimum to analyse and reflect on games as examples of popular culture with students.

The general conclusion is that media consumption patterns among children and teenagers have changed markedly in the last decade. Out-of-school media consumption clearly has significant cognitive, affective, cultural and social consequences. Our understanding of media and of out-of-school learning from them is still incomplete.

Computers and Internet access, along with access to mobile phones and gaming platforms, are widespread in society but not universal. Although home access is not synonymous with use, a socially-responsible institution will still have to bear social differences in mind when planning or even mandating off-campus ICT use by students.

For those entering higher education, we should be aware that out-of-school media consumption may well lead to greater familiarity with computers and the Internet, improved hand-eye coordination, a reliance on trial-and-error as a learning strategy accompanied by sophisticated tastes in virtual, three-dimensional worlds. The increase in time spent watching, playing and connecting may be at the expense of developing reading and information processing skills.

Supply side issues

In the first section of the article, mention was made of the fact that media can no longer be defined in terms of their technology. Today we can listen to "radio" on a radio, on a computer via the Internet, on a combined mobile phone with built-in DAB radio or in recorded form on an MP3 player.

The emergence of digital devices coupled with the move from analogue to digital transmission and communication – technological convergence - has enabled this media convergence and at the same time has allowed for a greater differentiation of devices – device divergence or specialisation.

In the course of less than two decades, the so-called content industries (primarily publishing, broadcasting, multimedia, games and the cinema) have begun their migration from analogue to digital technologies and platforms. In many parts of the world, liberalisation first of broadcasting followed by telecommunications lead to increased competition not only within the existing value chain but horizontally across the value chains for voice services, data services and broadcasting. The supply of digital content measured in terms of the number of digital channels, portals or services grew rapidly as a response.

In an article about the future of public service broadcasting, Davies (2000) quantifies this. Table 4 exemplifies what is evocatively termed "A Niagara of supply". In the course of a decade the supply of a range of media has increased dramatically, especially television channels and web pages:

Media consumption in the UK	1988/1989	1997	Increase %
Magazine titles	2,042	2,430	19%
Singles released	3,932	5,926	51%
Albums released	8,762	18,386	110%
Commercial radio channels	60	188	213%
Cinema multiplex sites	14	118	213%
TV-channels	4	60	1,400%
CD-ROM titles	380	16,762	4,199%
Web-pages	0	132 million	Infinity

Source: Davies (2001)
*Table 4: The supply of media in the UK from 1988 to 1997*

While the supply has increased, there has only been a modest total increase in media consumption measured in hours. A case in point is the Canadian Broadcasting Corporation. As Barry Kiefl wrote in 1999, "The average amount of weekly viewing hours has remained constant at about 22-23 hours per week for decades even though the selection of viewing possibilities has increased. This means that the average person who once watched one hour for every 45 hours of TV available now watches one hour of every 120 hours available. As this ratio has increased, the average audience per program has decreased substantially, even for the traditional networks programming for mass audiences."

In such a universe, the supply of increased choice and personalisation come at a price: fragmentation of national markets and the challenge of globally produced content to cultural values at national and regional level.

Fragmentation means that as the number of channels increases, fewer people are likely to view a given channel. Indeed, we can no longer assume that a given nation or region will have shared mass media experiences apart from major national events such as a royal wedding, or catastrophes of epic proportions such as the September 11attacks on the World Trade Center in New York and on the Pentagon in Washington.

For DR as a public service broadcaster, these changes in consumption have also been significant. As can be seen from the following graph which shows television viewing over a 24-hour period in 4th quarter 1998 and 4th quarter 2000, the proportion of 12-20 year olds watching prime time television dropped for all television channels by between 8-10%. The decline in DR's audience in this group was at least as big as for the industry in general:
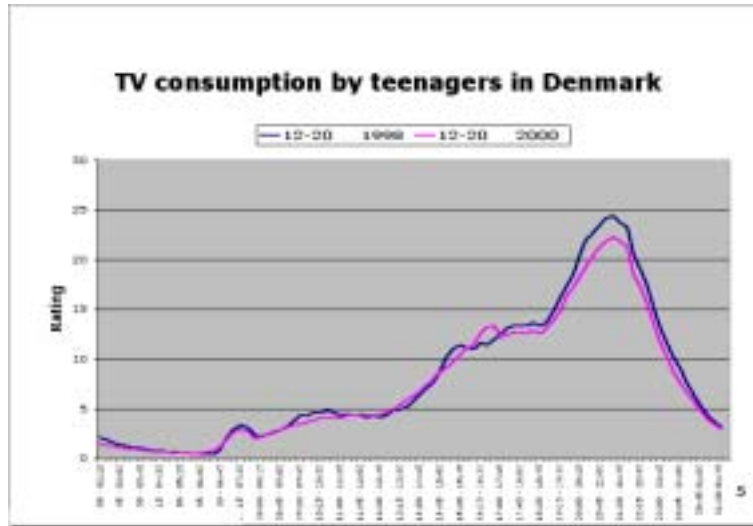
Figure 5: TV consumption by teenagers in Denmark 1998-2000

We can conclude that liberalisation and digitalisation have been drivers of market and media convergence. While the supply of electronic information, entertainment and education has increased markedly, consumption - whether measured in user hours or spending on media - has not. Audience fragmentation – the same audience spread out over more channels – is one of the direct results, in particular among younger audiences who are early adopters of many interactive information and communication technologies.

What can we expect in the next five years or so?

Bourne (2002) foresees that media expenditure in Europe will continue to grow at the rate of 8-9% per annum for the next few years and will account for 4.5% of total average consumer expenditure in 2005.

In terms of media consumption patterns, interactivity is slowly going to make inroads in normal television viewing:
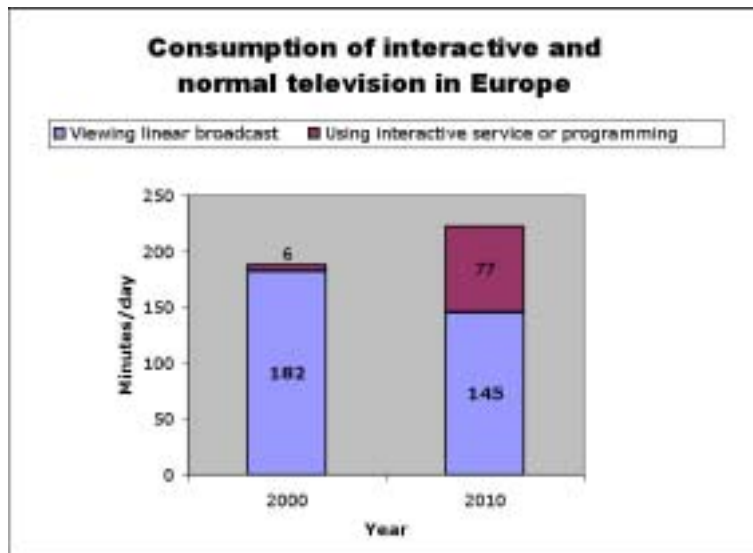
Figure 6: Consumption of interactive and normal television in Europe
2000-2010

In a detailed study of the digital television an broadband in Europe commissioned by the European Commission, Ongena et al (2001) forecast that overall television viewing (both digital television and broadband services to television) would increase by some 18% in the course of the decade. The

viewing of interactive services and programming would account for 77 minutes a day, whereas the viewing of "normal", linear television would slowly decline from 182 to 145 minutes per day.

Community and peer-to-peer activities are also going to account for a large chunk of interaction on digital television. Gaming and betting, depending on legal restrictions, and to a lesser extent other kinds of entertainment and information services will also take their share.

According to Keen et al (2002), games on computers, video consoles and the Internet are already being joined by games on digital television new generations of mobile phones. Massively multiple-player online games (MMOGs) have recently emerged as a significant phenomenon not only in the USA and Europe but also in countries such as Korea. Gaming will gradually become more common as its demographic appeal widens.

When talking about what Van Dijk (1999) terms the Network Society, there is often the assumption in general debates on the subject that the term "network" is synonymous with the Internet. My interpretation is somewhat different. I view "network" as a *human* network, the means by which humans choose to inform and communicate with each other.

Currently, the Internet is the most ubiquitous physical infrastructure supporting information and communication. Across Europe we are seeing another digital network, digital television, that offers immersive, engaging televisual experiences and services via cable, satellite or terrestrial transmission. In the course of this decade, third generation digital mobile systems will deliver multimedia services anytime and anywhere for those who wish to pay for them. New, on-demand interactive services on broadband Internet - whether they be via fibre to the home, on existing copper wires or ultra-wide wireless transmission - will also appear in this decade. The Network Society is thus becoming a society of multiple digital infrastructures, not just the Internet, all jostling for a share of our attention and our money.

As media convergence leads - at least superficially - to greater choice on a wider range of devices, and given that teenagers tend to be early adopters of new devices and services, they in particular will be the subject of targeted media aiming to correct the loss of young audiences on television. The classic ingredients of engaging television, fascination and identification, will be generally found in media when we are watching, playing and connecting. Adding interactivity will promote participation and a sense of community, one of the important dimensions now only found when watching major sporting events.

As a consequence of these supply-side changes, we can expect to see continuing change in the media consumption patterns of children and teenagers in the foreseeable future that also will have an impact on education.

Conclusions

My personal conclusions on the impact of out-of-school media are clear: the use of ICT in education is only playing a contributing role in the acquisition of creative ICT skills by our young citizens. If we accept that learning involves the acquisition of knowledge, an active process entailing relations between what is already known and what is new, then we have to look more carefully at how ICT in a broad sense is being used out-of-school

For preschoolers and the youngest pupils in primary schools, we will have to encourage conventional play and social activities until we can be sure that a child's perceptual and psychomotor skills are adequately developed before engaging in the use of virtual environments and worlds. ICT for this age group will be primarily tool-based computer activities for small children working together, allowing the teacher to build on the best of what happens in the living room and bedroom to further educational aims. Even among elder children and teenagers, the teacher will have to become better at promoting meta-cognitive processes so that his pupils will develop the ability to reflect on what they are doing and to assume joint responsibility for learning outcomes as they move from childhood to adulthood.

As teenagers move on to college and university, they will be taking with them skills and attitudes acquired both in and out of school that will influence how they judge teaching and learning resources. Watching, playing and connecting account for a substantial proportion of our students' waking hours.

Those in tertiary education will need a far more solid basis than this paper to exploit synergies with out-of-school pastimes, to build upon what has already been learnt and to make allowances for what has not.

As has been remarked, given the marked gender and socio-economic differences in media consumption, education can play a critical role in contributing to a reduction of social polarisation.

If educational policies and practice take into account what happens in the surrounding world, we will no longer be sailing into uncharted waters. Getting to know what makes our students tick will ultimately help education to work towards a Network Society focusing not on bits and bytes but on interpersonal information and communication, with the potential to further the balanced development of all young adults in society.

References

Becta (2002a) Computer Games in Education Project: What aspects of games may contribute to education? http://www.becta.org.uk/technology/software/curriculum/computergames/aspects.html

Becta (2002b) Exploring the potential of computer games in schools conference.   20 March 2002, ExCel Centre, London.
http://www.becta.org.uk/technology/software/curriculum/computergames/conference_200302/index.html

Bourne, Matthew (2002). Media expenditure changing patterns: the "connecting" phenomenon. The SIS Briefings no. 50 July – August 2002, EBU, Geneva.

Davies, Sian (2000). Predicting the Future. The SIS Briefings no. 36 December 2000 – January 2001, EBU, Geneva.

Drotner, Kirsten (2001). Medier for Fremtiden – børn, unge og det nye medielandskab. Høst & Søn, Copenhagen, Denmark.

Egenfeldt-Nielsen, Simon & Heide Smith, Jonas (2000) Den digitale Leg - om børn og computerspil (digital play - on children and computer games) Hans Reitzens Forlag, Copenhagen.

Egenfeldt-Nielsen, Simon & Heide Smith, Jonas (2001) Vold og effekt (Violence and its effects) http://autofire.dk/autofire/Hovedsider/voldogeffekt.html

Goldstein, Jeffrey. Effects of Electronic Games on Children. Overview prepared for the Interactive Digital Software Association, USA. http://www.senate.gov/~commerce/hearings/0321gol.pdf

Keifl, Barry (1999), "What Will We Watch? A Forecast of TV Viewing Habits in 10 Years", http://www.cbc.ca/research /wwww.html (no longer available) quoted in http://adwin.ca/athena/lit_220.html

Livingstone, Sonia (2001) and Moira Bovill, editors. Children and their Changing Media Environment: A European Comparative Study, Lawrence Erlbaum Associates, UK.

Keen, Ben (editor) (2002). Wireless, Interactive TV and Onliner Gaming – Market assessment and forecasts. Screen Digest, London.

Kirriemuir, John (2002). The relevance of video games and gaming consoles to the Higher and Further Education learning experience. 23rd April 2002, JISC, UK.
http://www.jisc.ac.uk/techwatch/reports/tsw_02-01.rtf

Koffler, Peter (2002) Presentation on computer and console games, EU Presidency Seminar of Experts on Framework Conditions for Content Production in New Interactive Media, 22-23 July 2002, Copenhagen, Denmark. Danish Ministry of Culture.

Lyman, Peter (2002) et al. How Much Information? UC Berkeley's School of Information Management and Systems November, 2000 http://www.sims.berkeley.edu/how-much-info/ based on Statistical Abstract of the United States, Table 920, 1999
http://www.census.gov/prod/99pubs/99statab/sec18.pdf

McVeigh , Tracy (2001) Computer games stunt teen brains The Observer. Sunday August 19, 2001 http://www.observer.co.uk/international/story/0,6903,539166,00.html

Ongena, Didier et al (2001) Study relating to the directive "Television Without Frontiers" – lot 2 (Outlook of the development of the market for European audiovisual content and of the regulatory framework concerning the production and distribution of this content). Andersen Consulting, Public Workshop, December 10, 2001. Available on the Internet at:
http://www.arthurandersen.com/resource2.nsf/vAttachLU/BelgiumTVwithoutfrontiers/$File/SecondPublicWorkshop.pdf

Van Dijk, Jan (1999). The Network Society – Social Aspects of New Media. SAGE publications. London, UK.