Chapter 7
Processing Change Instigated by Immersed New Media Usage and its Implications for School-Based and Informal Learning

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EXECUTIVE SUMMARY

This case presented in this chapter[1] revolves around the hypothesis that information processing has changed from a linear format, within a chronological progression, to a partially controlled chaotic format, with tracking achieved primarily through hypertextual nodes which goes against the enforced linearity of most institutionally imposed hierarchical learning. Suggestions are given as to how basic schooling methodologies may need to be modified to conform to new learning practices. The possibility of the informal learning option more amenable to hypertextual processing is also explored. Online whimsical searches and acquisition of information through social software interaction and other new media technology immersion has changed the breadth of informal learning, particularly self-directed and incidental learning. In a study of University of Malta students that requested self-perceptive descriptions of learning preferences (formal study/independent acquisition). 70% opted for formal study, explainable by their traditional academic context. 30% preferred flexibility and the intrinsic motivation stimulated by self-direction; a significant number given that a decision about a life choice was requested.

BACKGROUND

Internet usage in more technologically advanced continents has grown massively as shown in Table 1. There has been a huge usage growth since 2000, and there is a 50.1% penetration in Europe, 60.1% in Oceania/Australia, and a massive 73.9% in North America. At least in Europe, quoting slightly older statistics, 73% of young people aged 16 to 24 use the Internet at least once a week (Eurostat News Release, 2006). There can be no doubt that this has grown exponentially.

In the main the majority of researchers agree that the Web permits, among many other intrinsic and extrinsic gains, "learning through frequent interaction and feedback" (Donnerstein, 2002, p.

DOI: 10.4018/978-1-60960-015-0.ch007

320). The same applies to video games, which are multi-layered problem-solving experiences in which, for example, identities are assumed that promote intrinsic learning (Gee, 2003, Shaffer, 2006). More formally, learning can even be digital game-based, all about "the coming together of two seemingly diametrically opposed worlds: *serious learning* in schools and in businesses, and *interactive entertainment* – computer games, video games..." (Prensky, 2007, p.15)

Some research results are not so positive, indicating the possibility of Internet addiction. For example McKay, Thurlow and Tommey Zimmerman (2005) treat optimistic research about motivation resulting from immersed internet usage with caution and wonder as to whether young users are becoming little more than "techno slaves." This goes as far back as Greenfield's 1999 reference to "netheads [and] cyberfreaks." Internet addiction seems to be a well-analysed social fear (Chou, Condron, & Belland, 2005). The same applies to video games, with research indicating that immersed users' scholastic grades suffer (Anand, 2007) while at the same time admitting that determining whether this is because of time management disruption caused by dependence or because of other, collateral factors is difficult. Time loss through video gaming was considered to have both negative and positive outcomes in research by Wood, Griffiths, and Parke (2007), though the contexts of this research are predominantly social. Teaming up video gaming with the internet in the form of Massive Multi-user Online Role-Playing Games (MMORPGs) is often considered lethal and addiction almost a natural and accepted side-effect (Young, 2009).

The focus in this chapter is on processing changes caused by New Media immersion that are more intimately related to cognitive acquisition which have recently begun to be explored (Salonius-Pasternak & Gelfond, 2005), rather than to Internet-affected social interaction. The negative effects of Internet and other New Media usage may be exaggerated and sensationalized and may blind researchers to other intrinsic changes that are happening because of the usage. I am not negating that addiction is a distinct possibility, given the affective strength of the media in question, but my arguments are that if the literature were to concentrate entirely on that aspect, the side to New Media immersion that invokes, provokes and consolidates processing changes, and that needs understanding, can easily lag behind.

As a result of this immersion, informal learning — that "vast reservoir of learning possibilities" (Tuschling & Engemann, 2006[2]) — is gaining an advantage over more formalized, school-based learning. This chapter also deals with the growing

Table 1. Internet usage and world population dtatistics for June 30, 2009

World Regions	Population (2009 Est.)	Internet Users Latest Data	Penetrati on (% Population)	Growth 2000-2009	Internet users by World Region
Africa	999,002,342	65,903,900	6.7%	1,359.9%	3.9%
Asia	3,808,070,503	704,213,930	18.5%	516.1%	42.2%
Europe	803,850,858	402,380,474	50.1%	282.9%	24.2%
Middle East	202,687,005	47,964,146	23.7%	1,360.2%	2.9%
North America	340,831,831	251,735,500	73.9%	132.9%	15.1%
Latin America/Caribbean	586,662,468	175,834,439	30.0%	873.1%	10.5%
Oceania/Australia	34,700,201	20,838,019	60.1%	173.4%	1.2%
World Total	6,767,805,208	1,668,870,408	24.7%	362.3%	100.0%

Source: www.Internetworldstats.com. © 2001-2009, Miniwatts Marketing Group

preference for informal learning, presenting a brief review of relevant literature and limited research that indicates how inroads are being made into formally structured, traditional tertiary contexts.

Immersion also leads to deeper change, going beyond content influence and intrusive persuasive manipulation — most likely it is affecting the very structure of information processing, defined by Perry (2003) within a cognitive science, problem-solving context as encoded information which is acted on and transformed in the resolution of a goal held by a cognitive entity.

These new informal venues of knowledge acquisition also have a new structure embedded into their architectures — a semi-structured architecture of semantic links that connect related knowledge with immediate access. Experts with these structures may have a fundamentally different approach to information processing.

The architecture of New Media languages has a pervasive effect on the cognitive perceptions and usages particularly of young immersed users of the media.

SETTING THE STAGE

The change that has been brought about by New Media immersion is more than societal. It is deep rooted and has affected cognition in ways that might determine the nature of teaching and learning for decades to come.

There are a number of ways in which this change has come about. New Media immersion can take many forms and is as wide-ranging as are the definitions of New Media itself. The term is old, and goes as far back as the 1980's, but interpretations are new and renew themselves regularly.

This chapter intends to look generally at New Media and how habitual usage has brought about a perceptual mutation that has led to a clash with societal norms, particularly when it comes to methodological practices in educational institutions.

If one were to think of New Media in terms of:

a. Computer-based technologies
b. Web 2.0 interactivity and Social Software usage
c. Interactive gaming (both personal and online)
d. Mobile technologies

It would be quite obvious that there are very few digital natives (Prensky, 2001) who are not in some way affected by the massive influx of these media.

There is an ongoing debate as to whether these young people are so massively influenced as to go through a disaffection with the norms of education and all other non-digital aspects of society in general (Bennett, Maton, & Kervin, 2008), but there can be little doubt that some sort of affective and cognitive change is taking place because of immersion in these media.

Highly representative of the research being carried out about digital natives is this statement from Marsh et al. (2005):

> Young children are immersed in practices relating to popular culture, media and new technologies from birth. They are growing up in a digital world and develop a wide range of skills, knowledge and understanding of this world from birth. (p. 75)

Some of the learning in these new environments is as adventitious and haphazard as learning in the real world, with unexpected challenges and feedback. Some of it is more structured and controlled, as in the interlinked networks of a wiki. These environments may take advantage of the learning skills honed in the real world, and they may challenge the structured modes of institutional learning as uninteresting and stultified.

The earliest literature on video games has indicated that they have affected cognition, particularly in iconic or analog representation (Greenfield, deWinstanley, Kilpatrick, & Kaye, 1994). Extended immersion provides extensive indications that there is an ongoing transforma-

tion of cyber users' cognitive processing capabilities. The result is a change that permits ease of navigation, problematisation of situation and circumstance, and decision-making in environments that have moved architecturally away from the incremental, step-by-step demands made in traditional educational environments.

The essential base providing change is hypertextual in nature. Hypertext itself was deemed to be the fundamental element in the constructivist "textbook of the future" as far back as 1993 (Cunningham, Duffy, & Knuth, 1993).

There is an extensive literature examining Hypertext Assisted Learning (Niederhauser & Shapiro, 2003; Shapiro & Niederhauser, 2004), with its singling out of the main features of hypertext, primarily its non-linear structure, its flexibility of information access, its bite-sized approach to structuring knowledge, and its greater degree of learner control. Like the real world, it brings distantly related events and constructs into juxtaposition. Like the real world, it lets learners question their own understanding of the events and select aspects to ponder. Unlike the real world, it lets learners explore those connections they find interesting and personally meaningful, and provides a consistent interface and structured avenues for that exploration.

The early literature too found strong differences among learners in the way they used hypertext links. The distinction is made between "self-regulated readers" and "cue-dependent readers" (Balcytiene, 1999), with the second scoring better on content acquisition than the first, but with the first being more independent and exploratory in the way hypertext is read.

A number of theories have explored the need for learners to adjust their cognitive processes in the face of hypertextuality and conceptual complexity and irregularity in knowledge domains, predominantly Cognitive Flexibility Theory (Spiro, Feltovich, Jacobson, & Coulson, 1991).

As in that theory, what is being proposed in this chapter also demands adaptability to an irregular stimulus. The metacognitive processes involved put the learner firmly in the centre of the learning in a cyclical process, the medium feeding the learner's own conscious approaches to the usage and the subsequent learning, with that same usage modifying the mechanisms of perception and application, and reflecting on the actual medium. This is particularly true in the contexts of independently-used, flexible learning environments (IUFLEs) in which the learning itself provides motivational impetus.

The social reality surrounding technology-heavy environments in which immersed users thrive is that informal, independent, flexible learning is much more in line with the new random processing. Research shows social software's effectiveness in this regard, both as reinforcement of existing learning and as a motivational instigator of learning all by itself (see, for example, Milheim, 2007; Selwyn, Gorard, & Furlong, 2006).

It is almost a superfluity to state that the spread of personal computing and mobile technologies, together with, static and mobile gaming consoles, has revolutionised the dissemination of information on demand. This information includes ephemeral, transient facts that might be useful only to (say) the game being played, or it might include more detailed, fully-fledged online searches. In all cases, the change is persistent and though more common in the younger digital natives, it reaches quite far into society since cyberculture has permeated all generations at present, with some more amenable to integration with the culture than others, since a formidable adherence to formal modes of information acquisition is also evident in some contexts.

Cross- and inter-active Web 2.0 applications such as Weblogs and wikis and such user-addictive phenomena as YouTube and peer-to-peer audio sharing, social networks, as well as online fora and chat environments, are proving a ready source of byte-sized, non-hierarchically scaled items of information. These resources cumulatively build into a library attuned to this new kind of

HTP learning, but it does not necessarily have an institutionally accepted focus. Mobile technology also contributes directly to "learning-on-the-go" — creating a perpetual chain of information through technology. All of this is beginning to be used tentatively in schools (Sang Hyun, Holmes, & Mims, 2005).

Immersed internet users, and heavy users of social software, as well as many forms of video gaming, live in an environment in which knowledge acquisition is at their fingertips, and the processes they have mastered to interact with the software also gives them the rudimentary skills needed to navigate, absorb and integrate the learning into a cohesive, if chaotically absorbed, body of learning. In this sense, the acquisition is both substantive and procedural – the content of the learning, teamed with the navigational process (for the internet) and manipulative skills (for gaming) that utilises that content in tiered, sometimes hierarchical, at others random, ways.

"The structure sought here is integrative, a self-reflective technique of self performance ideally centered in the individual. It seeks to make learning independent from setting, from personal and financial effort. Informal learning can take place regardless of circumstances" (Tuschling & Engemann, 2006, pp. 456-457), and it can take place any time and anywhere, given that New Media technologies are both desktop and mobile.

A lot has also been written about how the blog has created an invaluable vehicle for vociferous self-expression. Can the blog itself be a means to producing feedback from independent learning? "Could blogging be the needle that sews together what is now a lot of learning in isolation with no real connection among the disciplines?" (Richardson, 2004). Certainly the use of blogging and beyond - the immersion into the interactive multiverse that links together so many different users/feeders of knowledge and opinion, is providing an enormous amount of learning 'on the run'. The "e is for everything" concept spearheaded by Katzand and Oblinger (2000) and interpreted by Wheeler (2007) as "extended learning," "enhanced learning," and "everywhere learning," emphasizes the all-encompassing presence of the learning source, and the persistent, erratic, but ubiquitous learning that is totally learner directed and informal.

Informal (or non-formal, as described by Eraut, 2000) learning is a persistent happening that we often find difficult even to conceptualise as actual learning. It is incidental in the main, and can take the form of anything from reading instructions in a recipe booklet to reaching out for an encyclopedia to look for a reference.

A more formal definition is given by Livingstone (2001), "Informal learning is any activity involving the pursuit of understanding, knowledge or skill which occurs without the presence of externally imposed curricular criteria." (p.4). Meaning that there is no help offered to the person acquiring the learning, and no structured studies programme to follow. This also means that no institutional learning of any type is a part of it, nor is any type of online instruction, or learning that is organized in any way, directly or indirectly.

The three forms that informal learning usual takes are (1) Self-Directed Learning, (2) Incidental Learning, and (3) Socialization (Schugurensky, 2000).

To define the individual forms: *Self-Directed Learning*: or that learning that is taking on as a "project" by the individual. A lot of informal learning that happens online is of this type. *Incidental Learning*: non-intended learning that happens on the side of an activity, or even as an indirect result of self-directed learning. In informal learning online this can happen, for e.g., through hypertextual meanderings beyond the web-pages sought consciously by the person browsing. *Socialization (tacit learning)*: "refers to the internalization of values, attitudes, behaviors, skills, etc. that occur during everyday life. Not only we have no a priori intention of acquiring them, but we are not aware that we learned something." (Schugurensky, 2000, p.4).

Informal, on-a-whim searches for information have, by necessity, redimensioned the concept of informal learning, with volume often (though never totally) compensating for a lack of learning organisation.

Efforts have been made to find ways of integrating informal learning into a more structured, formal design. One form this takes is the recognition of prior learning (RPL), "a process whereby people are provided with an opportunity to have the skills and knowledge they have developed outside the formal education system assessed and valued against qualifications frameworks" (Hargreaves, 2006, p.1), often surfacing in the field of Adult Education, and taking the form of the acceptance of assessible competence, possibly accrued through experience and the other venues of informal learning (for e.g. in Sweden, Andersson & Fejes, 2005; in France, Pouget & Osborne, 2004; and in Australian Universities, Pitman, 2009).

In the case of on-a-whim searches, though there is no denying the massive infusion of informal learning that happens on a daily, purely personal basis, there is no cumulative objective to the learning, nor is it built against an assessable framework, in most cases making accreditation very difficult.

As is the case with a reformatted school-based learning, the issue of motivation is essential in this type of learning. In this case motivation is hardly ever extrinsic, as it often is in schooling, but intrinsic. It is the impulsive need-to-know about some aspect of a personally appreciated topic. In the case of young people this takes the form of searches related to music, gaming, films, etc., and is often a side-task during social-software interaction.

Because of the transient nature of the information searching, and the questionable qualifications of many of the websites consulted – Wikipedia being forefront in this, with academics split on its use by students (Eijkman, 2009) – it is contended that the process defies integration within a formalised academic setting, though attempts at self-paced project work that demands web-searching have often been made at both secondary and tertiary levels of education. But in these, the all-important motivational elements that infuse the process are almost always missing since it is only the vehicle that is integrated within the formalised learning, and not the essential need-to-know motivational drive that normally fuels the use of independently-used, flexible learning environments. This is also the case with online learning systems, or, indeed, a lot of forms of e-learning, in which motivation is more difficult to stoke than in face-to-face teaching and learning, to the point where it needs to be singled out for interventional consdieration (ChanLin, 2009).

But IUFLEs are inscrutable in many ways. Not only are they very difficult to define, given the diversity of source and the whimsical nature of usage, they are also prone to negative effect by factors as divergent as national scholastic inclinations, academic and social traditions, and individual drive.

IUFLEs more often than not defy accreditation. While "assessment should be a vehicle for educational improvement", and "lecturers may need to provide different but equivalent assessment activities "(Cummings, 2003), the main problem with the new independence and flexibility in learning is not acceptance, it is that no formalized way of accrediting information is gained through Web interaction or direct individual research, in spite of some National Qualification Frameworks' statement to the opposite (Young, 2007). The problems for the formalization of what is essentially the most informal of all ways of accessing information are legion, and very few fit in with the quantifiable assessment practices in use today in most universities. This is particularly true of the more traditional universities, and in spite of the fact that "wider inclusion in a learning society may come more easily from greater recognition of tacit knowledge than from more participation" (Gorard, Fevere, & Rees, 1999, p. 451).

Other Considerations

Learner control depends extensively on how individuals who use the hypertext use the baggage of prior knowledge they bring with them to the usage and how this affects whether learner control predominates. The indications from the literature (for example, Gail & Hannafin, 1994) are that those with high levels of prior knowledge are more in control than those with low levels of prior knowledge, who prefer more structured program-controlled hypertexts. However, hierarchically-structured texts, so often touted in research on learning from traditional text, are not necessarily indispensable when used by novices using hypertext. Surface information seems to be acquired regardless of structure (Shapiro, 1998), though deeper meaning does benefit from a structured approach. Hierarchies can be built even in unstructured hypertext links, providing they have cues to meaning (Shapiro, 1999).

Interestingly, eye-tracking research about novices learning how to use computer games indicates the preference of a trial-and-error strategy, with little time given to actual teaching hints as they learnt how to use the game (Alkan & Cagiltay, 2007). Documentation was not easily available in the experiment, but none of the participants complained about this, as they immediately began overcoming the obstacles and independently figured their way around the gameplay, the learning of which they deemed to be easy.

Among many learners, strong, independent problem solving seems to be prevalent in self-regulated users' navigation of these media, with metacognitive processes at work creating a schema-driven means of procedural acquisition.

The hypothesis that is being presented in this chapter is that the process goes beyond this, and the cognition of the structures reflects the navigational processes in the media. The result is an intrinsic, cognitive and affective move from predominantly linear processing to a more lateral one. In many cases this takes the form of hypertextual leaping. This moves the onus from the singular focus to a more diversified, multi-focus, superficial in content but quite wide in spread, taking advantage of the freedom associated with hypertext that is evident even in the early literature on its use (e.g., Rouet & Levonen, 1996; and George Landow's seminal volume on the topic, now updated, Landow, 2006), and in direct structural links with, for example, the cinema (Mancini, 2005) and literature (Schneider, 2005), and more broadly perhaps with real world exploration.

This is a cognitive strategy that has also already found mirroring on such popular stations as MTV with its multi-focal-point announcer presentations and erratic camera movement in sequential narrative, and its use of the fragmented, juxtaposed editing of visuals that interacts with and responds to the rhythm and lyric of the sounds of the music (Williams, 2003).[3] Indeed, traces of hypertext-induced influence have been evident for a while in a lot of postmodern works of fiction, film and the visual arts (Gaggi, 1997).

There is a byte-sized communications revolution. This includes the abbreviated mobile phone instant text message, the short burst message on social networks Twitter and Facebook, as well as the language used in internet chat rooms. They are by themselves changing the nature of language – creating nu-speak (Herther, 2009). This is further corroborated by the quick-flip style of editing in television advertising, not to mention the minutes long television serial sequences in between frequent advertising breaks, and even the short sentence, short chapter mode of novel writing, exemplified by several bestseller *novels*, all contribute directly to corroborate the context and effects of hypertextuality.

Speculatively, the result of persistent immersion is Hypertextual Processing (HTP) which organizes perceived information into an erratic, loosely grouped number of simultaneous focal points resulting in coherent, if sporadic, information gain (Mallia, 2007). This provides a change from a linear format within a chronological progression to a

partially-controlled chaotic format, with tracking achieved primarily through hypertextual nodes. One such unit, taken out of a typically hap-hazard set for the sake of analysis, would contain a large number of random information/'instructional clusters, strung together by means of an arbitrary lattice-work of hypertextual points (or nodes), themseles independent of each other, though at times periferally linked through wide-ranging topic or keyword relationship.

In turn, this conflicts with the perceived linear (if stratified) organization of thought processes on which presumption most traditional school-based pedagogies and training programmes are built. The conflict makes for a very limited attention span and a resultant lack of follow through.

Nor does the move towards HTP appear to be limited to certain age groups, though the vulnerability of the young does single them out for particular influence. Digital natives are by far more susceptible to this than digital immigrants – though it seems that it is the volume of media immersion creates the processing diversity rather than the age itself. Though I am unaware of any laboratory testing for this particular presumed change specifically, it would be interesting to conduct a diachronic study of similar IQ subjects diversified in media exposure (perhaps on the basis of their past experiences and preferences) – linear/chronological (books, certain tv programmes, radio) and non-linear/saltatory (the Internet and multimedia, including game console software). To date, many of the links posited in the literature between video games and education are quite ephemeral, concentrating more on how gaming can be accepted by teachers and how it can be utilized in a format that integrates with ongoing classroom methodologies (see, for example, Hutchinson, 2007).

HTP affects to varying degrees and is dependent on a number of variables, not least of which are varying cognitive styles (Riding & Rayner, 1998). As well, the individual learning strategies of the immersed user can determine how and in which way hypertextual architecture is perceived and handled (Graff, 2005).

Another important variable is cognitive load (Sweller, van Merrienboer, & Pass, 1998), for which each user has a particular threshold, and for which individual solutions need to be found, including users adopting varying cognitive tools that also determine mind-set and cognitive change (Ozcelik & Yildirim, 2005).

CASE DESCRIPTION

Most of the assumptions presented here have been derived from an analysis of primrarily qualitative data gathered in the main from the following:

- Qualitative observation of *in situ* subjects — intensive observation of young people aged 13 to 18 playing platform and role-playing games in a self-regulating manner noting timing in the decision-making process, eye-hand coordination speeds and variations, browsing style and ease, hyper-linking frequency and patterns, and navigation through stratification. Each subject showed an evolving grasp of navigation and goal-oriented problem solving. There was a progressive mastery of content, so both substantive and procedural gains were noted.
- Focus groups with young people about media immersion and resultant effects — the ages of participants varied from 18 to 22, in the main University of Malta students. All were New Media users to varying degrees. All participated in online chat (from under 1 to 6 hours a day), all used mobile phones extensively, particularly to send SMS's, and around a third were gamers (from casual to fully immersed). Effects of lengthy immersion in both gaming and online browsing varied, but lack of focus, alienation, and an inability or preference

not to follow linear conversations and follow uni-directional lectures were particularly noted.

- Semi-structured interviews with school teachers who recognise a rising lack of rapport between traditional methodologies and student interest — the interviews were for another area of research, but a number of questions were about student interest and motivation, the result of which brought out what they believed to be the collocation between technological immersion and diminishing attention span, corroborated by the noting of increased motivation and focusing when HTP was used as a back up to top-down, class-based teaching.
- One directed and one open-ended question on preference between formal and informal tertiary-level learning, as part of a longer questionnaire in the process of analysis. Information about this part of the research is given further below in this chapter.

This last research point needs to be gone into in detail because of the implications it has on the effect that HTP has on formal education.

The question that needs to be asked, and which underscores the case, is: Are we on the brink of the inception of informal "universities" owned by immersed cyber users? How credible will the product be of these populist non-institutions that bring together non-registered learners who browse and surf and get their problem-solving skills from RPG (online or on games consoles) and strategy gameware? How will formal institutions take on board such learning, which, arguably, is motivationally and stylistically more suited to lateral processing than what can be accredited by both traditional and online universities and schools, even if they take on board the suggestions for methodological rerouting to be found in the present work?

In order to determine just how many would actually opt for a life-choice of informal acquisition as opposed to institutionalized learning, the following limited research was undertaken.

The research in this regard has been carried out on the Mediterranean island republic of Malta, an EU member state, and with 413,609 crammed into a total area of 316 km^2, one of the most densely populated countries in the world (information taken from Wikipedia).

Internet access in Malta in 2008 stood at 59.0% (NSO, 2008), just below the 60% average of the EU27 according to Eurostat (Lööf, 2008). Eurostat also indicates that across the EU27, by far the greatest users are between the ages of 16 and 24, and educational background only creates a minor disparity in this age bracket.

Only undergraduate research has been carried out on the internet usage habits of the University students in Malta, so a study in this regard, albeit with a slant in favor of discovering browsing behavior, was in order.

A questionnaire on internet usage was sent to 6000+ University of Malta students by internal mail. 1,600 valid questionnaires were returned to the researcher. All respondents had an internet connection, either at home, or at University, or both. The questionnaire was multi-faceted in content, and sought information about student habits regarding their use of the internet, with particular regard to individual, non-directed use. Information was sought on which sites were most visited by the students for independent search, and which were used mostly for academic searches. Other areas tested were multi-tasking, multi-focusing, hypertextual processing, self-perceptive distinction between directed and non-directed searching, as well as online communication and socialisation habits.

As this chapter is being written, the questionnaire is in the process of analysis, but, for the purpose of getting at least an idea with regards to formal/informal learning preference of University Students, most of whom can lay claim to being digital natives, a number of offshoots using random samplings from the instrument have

yielded a telling glimpse into Maltese student learning format preferences. One open-ended question in particular was intended to provide insight into student preference regarding specifically formal/informal learning. It is true that this relies entirely on respondent perception, and there is no validating exercise to corroborate this take on the question, but perceptions are also useful and indicative.

The question was: "Given a life choice between formal, directed study (for e.g. a university degree course) and independent, non-directed acquisition of information (for e.g. non-accredited, internet based, incidental learning), which would you choose?" In the next field, participants were asked to give an explanation for their choice in as much detail as possible. A random 300 replies (across faculties and roughly 50-50 by gender) were chosen from among the submitted questionnaires, and the explanations were in the main analyzed qualitatively.

Apart from the move to independent, flexible learning, anumber of residual permutations and implications of the possible change to HTP exist. For example, limited qualitative research in a school for lower-achieving students (mostly all illiterates) but who are quite well versed in the use of games consoles has led to experiments regarding how the visual dimension can act as a replacement to symbolic literacy (Mallia, 2003). The link with HTP manifested itself in a mapping of their use of a digital editing suite, in which their sequencing proved quite non-linear, but very intuitively effective. A number of variables may explain this away, but the narrative in each case was relatively clear and complete, with only the intrinsic linearity of sequencing often missing.

Findings

70% of the random sampling ticked the *Formal Study* field, whereas 30% ticked the *Independent Acquisition* field. This is interesting on many levels, not least in its profiling of the learning methodology preferences of University of Malta students. The University of Malta is a traditional, teaching University, which has embraced technology in its many facets (uses SITS campus wide for all registration, marks posting, etc.; has a progressing, fully integrated website; uses one-password access for all services), but is still to have formally accredited e-learning, though a VLE was officially chosen recently, and, in all fairness, Moodle had been used randomly by individual academics to varying degrees for years prior to its sanctioned embracing by the University itself. However, in the main, courses are delivered face-to-face and the lecturing system is predominantly top-down.

The indications are that this influenced students in their choice of formal study. The inverse could actually be true, and that their presence at the university might indicate their need for supervised learning. Unfortunately this cannot be corroborated, since the University of Malta is the only university on the island, so there is no room for informed student choice in this regard.

This chapter is considering only that informal learning that comes from self-directed online searches and any incidental learning that comes from it. Socialization as defined can have a very important online dimension, particularly through social networks, as well as VOIP usage – a large percentage of all those who submitted the questionnaire listed as participating actively in one or more social networks, and very few did not make use of communications networks and VOIP. However, for many of those who chose the formal study field, socialization factors were reasons to do so. What was often described as "real" socialization played an important part in making many respondents opt for formal study. Malta's size could also be a significant factor in this.

Also confirming the predominant style of teaching and learning of their *alma mater*, the need for guidance and the fear of redundancy in their online searches figured quite extensively. This was corroborated by an airing of insecurities about individual abilities, with "wouldn't know

what to look for", and "deadlines help get the job done", along with an adulation (inversely mirrored in the other field) of professional academics who pass on their knowledge and experience.

The third and final most important factor was accreditation. The qualifications needed to get a job, that one respondent described as "something which I think is the main engine driving students to learn, and not intrinsically for the sake of learning". Whereas in some EU countries there is a tentative move to accredit informal learning within a formal context (Colardyn & Bjornavold, 2004), there are few indications of this in Malta to date, so the reasoning is understandable.

On the other hand, most of those who opted for Independent Acquisition had a number of varied arguments, to make their point, for e.g. flexibility in subject change to avoid boredom; personal interest promoting concentration; not learning under pressure; enjoyment because of personal preference; relevance to the person's lifestyle; self-pacing permitting deeper delving; a more relaxed exercise; vaster choice of topics (i.e. not restricted to the curricular); no imposition. As one respondent put it, "nourishing yourself with knowledge".

There were those who believed that this fostered independent thinking and creative decision making, as opposed to working within the envelope of structured, formal learning. One respondent said that his browsing helped him get a "leg-up" when working in a team of people who preferred formal study. But all in all, the main motivation was "a mixture of personal interest, curiosity and wanting to learn."

Only one participant from the 300 said that "I prefer books, to be honest".

Given the limitation of the sampling, there is no more than an indication of preferences here, placed against an academic and social backdrop that seems to influence quite extensively the choice made by students as they interact with and are immersed in New Media technologies. The indications are, however, that there are those, so far in the minority, who opt for informal acquisition. The fact that this 30% exists at all, given that a "life-choice" was asked for, is an indication of flux in learning format preference. Informal learning as an option seems to be finding a place even among those studying in a formal institution.

The above deals with the highest level of institutionalized education, the University. But the implications of HTP and its effects reach back to all levels of education. For example, one potential direct effect of HTP is the clear pointing out of the lack of most schools' preparedness for coping with students who do not process linearly, as per the traditional approach to hierarchically-structured teaching and text-based resources (Collins & Halverson, 2009).

And it might even go further than that. The majority of teachers interviewed by the author, who have been in post for over ten years, stated that students are finding focusing progressively more difficult. This is predominantly the case in non-technologically aided traditional instruction, but some who supplement their face-to-face teaching with limited e-learning support have indicated that this is also true in formal online learning programmes that lack flexibility and are time constrained. So the indications are that HTP does not affect just formal class-based learning, but also many structured teaching methodological approaches, conveyed through whichever medium permits quantification for accreditation purposes, since that seems to be the intended aim of most institutional teaching and learning.

This brings forth a number of dilemmas within the context of schooling as it stands in a many countries. Often the changes caused as a direct or indirect result of HTP create a huge differentiation in learner approaches within the same learning community. This continues to load difficulty on the demands of inclusive learning environments. Also, currently many teachers come from the generations of either digital semi-literates or digital immigrants, meaning that there is little or no natural affinity with HTP students. This

necessitates acquiring a mind set that discerns heightened individual differences and moving to a hyperpedagogy in which "learning can become an endless process of democratic inquiry wherein essences emerge to fit the purposes of individual students and communities" (Dwight & Garrison, 2003, p. 718).

An understanding of the architecture of HTP change is a necessary base on which to build approaches to methodologies that can be effective with those who will otherwise be incompatible with traditional schooling, and be added to the existing long list of those who are deemed as "unteachables."

The following elaborations break down what can be deemed to be the cause, effects and possible modifications needed for change. The change can only be implemented if, first of all, some sort of acceptance of the reality of HTP occurs. Once that acceptance is in place, then the change needs to happen in order for learning within a formal environment to conform to HTP. The suggestions presented here are based on my research in schools, exploring the contrast between set methodologies and student reaction; my experience as a teacher within the educational system; and on interviews with teachers, with bases for the submissions corroborated by the observations and focus group data.

SOLUTIONS AND RECOMMENDATIONS

It is the hypothesis of this chapter that Hypertextual Processing affects attention, focusing, and cognitive processing. A look at the inferred cause and effect on each of these, and their effect in turn on pedagogical practice in school-based learning, can suggest ways in which that practice can change to accommodate the mutated processing.

Attention Span

Internet users are used to short, quickly accessed information instances that can easily be diversified and are often multi-media based; video-gaming often demands speed of sudden decision making and multiple switching; often instantaneous. Multimedia products also give information in small chunks, interlinked and cohesive, but individually compact. As a result of this, long readings and/or long dedicated explanations become daunting, and attention is lost after the first few paragraphs and/or sentences. Unless there are short, multiple media treatments, there is little to draw attention back to the task at hand. Concentrating for longer than an instant on any task defies the need for quick switching between (possibly inter-related) tasks, so often the chance of schematic mapping of the longer process is not possible, and the possibility of understanding is quickly lost. This is a perspective Ben Shneiderman championed throughout his career (Shneiderman & Kiersley, 1989).

If one were to take present pedagogical practice within a traditional teaching environment – a generalised top-down, teacher-student relationship – one can say that lessons are based on pre-planned chunking, each chunk hierarchically or independently listed within a lesson duration scheme of work. Chunks may vary in length, but each covers a topic or activity, and might last as long as a whole lesson.

In order to take on board the effect of HTP, it can be suggested that schemes of work should be based on seemingly random short activities, each of which links to the next at different moments, so there can be independent divergence by individual students. An overarching framework can be determined by the teacher, so that all possible outcomes of each activity should cohere to meet the overall pedagogical objectives for the lesson or sequence of lessons.

Multifocusing

Many uni- and vari- focal actions occur simultaneously during the playing of videogames. This is also prevalent on some Web pages, with flash adverts and pop-ups vying for (and usually getting) instantaneous attention. This has also found itself in the styles of many short streaming video clips, the brevity demanding a large number of cuts. This multifocal activity can also be seen in some young people's television programming. Depth of specific information is sacrificed for spread of stimuli and variety. The predominant effect of this persistent multi-focal reading is a resultant ability to spread focus on a network of equally attracting focal points. Most often the data input from the spread is relatively superficial, so the multifocusing, as opposed to persistent single focusing, is at the price of input depth.

What is most frequently being done in schools at the moment (also presuming a generalised norm) is the focusing on a single pedagogical objective, plumbing its depths and exploring its every aspect before moving on to another point to focus. This practice demands constant and dedicated attention by the students, forsaking even less focused distractions. Many of the summative exams held in the middle and at the end of scholastic years emphasise depth of knowledge as opposed to spread, although spread and depth are also demanded in the more exclusive schools. What can be done to counteract this and be more compliant with HTP is to break down of whole individual activities into short, flexibly accessed actions, researched and discovered by the students themselves, both individually and collectively. Actions that need to be taken might be simultaneous, or separate over a short period of time. The teacher can find ways to interlink the activities carried out over a period of time into a cohesive and coherent whole that further interlinks with other lessons learnt in this way.

Lateral Processing

On the Internet, as well as in multimedia and video game playing, there is a constant directionally chaotic navigation which has no linear, chronological progression as, for example, exists in the case of books. Hyperlinks can be found anywhere on a page, and hypertextual leaping from one page to another, or one element of the page to another, or even across pages and Websites (in the case of the Internet) is constant. A result of the use of hyperlinks on Internet sites and in multimedia products and the making of lateral, interlinked strategic movements in video game playing is a move away from linear processing, which is replaced by lateral and/or multi-directional processing. This makes concentrated uni-directional thinking difficult to achieve, and it is often replaced by seemingly chaotic instances of thought, that, however, might be tracked through thematic, stylistic or contextual nodes.

In most schools, teaching is chronologically directed, and this is particularly the case whenever textual resources (such as books) are used. The progression of lessons is hierarchical and the schemas that are scripted are mostly repetitive and formulaic. The result of the learning is usually summative and often tested primarily for cognitive recall in formal exams.

A suggested pedagogical practice in this case would be the instigation of flexible classroom learning in which computer and other media aided teaching can be used in individual projects determined by the students themselves against a backdrop of loose curricular structuring. Work should be self- or *ad hoc* group-paced and planned to link to flexible classroom teaching through hypertextual modules that can link at any step in the development of each project or module.

What is being suggested here is not the adoption of actual resources, such as specially authored didactic games or the inclusion of, for example, blogging within a formal, quantifiable instructional design. While social software coming to

the attention of instructional designers is laudable (e.g., Beldarrain, 2006), many of the focus group participants said that they find very difficult engaging with anything that subverts for didactic ends what they normally use purely for entertainment or non-directed informal knowledge gathering.

What is suggested here is the adoption of techniques that duplicate to some extent the pacing and syntax of main sources of HTP stimulation used as a base for a total restructuring of classroom and other learning routines.

CONCLUSION

Immersed usage of the Internet, with its predominantly hypertextual architecture, along with heavy usage of New Media technologies such as video gaming consoles, within a context of curt, swiftly shifting communications environments, has brought about a variable but quite evident information processing change that demands we rethink the paradigms of individual learning differences for educational purposes if schooling is to be considered. An understanding of the move towards informal, independent acquisition, given that a limited, but significant number seem to be moving in that direction, is also desirable if one is to fully understand the change in learning mentalities that have been instigated by New Media immersion.

Within schooling, teaching and learning methodologies that simulate cyber-technological environments may help bridge the gap between institutionally accepted instructional processes and more hypertextual processing-friendly approaches to educational acquisition.

However, the slow, but apparently logical move towards informal, independent learning, using the very vehicles of change themselves (the Internet, particularly Web 2.0 applications, and other New Media) seems to be the commonsensical way to go, with heavy users of New Media technologies finding a motivational setting away from institutions that are finding difficult discovering ways of formalizing for accreditation purposes the informal body of both substantive and procedural knowledge that is acquired by New Media users.

It can even be speculated that the non-linear, or hypertextual, processing which leads to informal, independent and flexible learning, has brought about a potential new route to Transfer of Learning, so elusive within rigid curricular face-to-face and online teaching environments. Speculatively, the diffusion and multi-focusing that are at the base of HTP, and the personalization, diversification and acquisition of general knowledge that infuse independent, flexible learning can create an amenable setting for the generalization and abstraction needed for effective transfer (Mallia, 2009). But more research is needed in this area to clarify variables and test the practice.

A number of ways forward exist. One way that can help young HTP learners is for formal institutions to adopt variants of the methodological styles suggested in this chapter, which might help reroute to institutional formats traits that would otherwise exclude the subverted learner from benefiting from a institution-based education. But the change goes beyond the classroom and is inherent to varying degrees in the affective and cognitive character-set of immersed New Media and social software users, which makes informal, independent routes to learning much more motivationally attractive to them and their mindset. This leads to a social, educational dilemma and for these informal learners not to be marginalized within an industrial system that often demands formal certification of learning, will require a roots-up institutional changes once the acknowledgment of the processing transformations is in place.

This chapter proposes that fundamental changes are underway in the preferred modes of learning by a whole generation.

The literature seems to be in two minds about whether to work towards integrating digital natives within already-existing structures, possibly sidelining the changes that have been instigated

by immersion, or to understand better what the changes are and change the methodological base of schooling. Another possibility is to embrace informal, incidental learning, and as is happening in certain areas of industry, accept that this can be a preferred way of skill, information and learning acquisition.

How institutions will eventually adapt to take advantage of these transformations, or whether they will do so, is unclear. A few modest proposals towards a better understand of the situation, and a possible adjustment of norms in order to embrace the change within learners, are offered here. However, the fundamental proposal is that more research needs to be carried out to help us understand better the nature and the extent of the change that is actually happening.

More discussion of future alternatives also needs to be conducted in thoughtful research-based and speculative fora, and more broadly within academic institutions themselves, as they begin to change to adapt to this new future.

REFERENCES

Alkan, S., & Cagiltay, K. (2007). Studying computer game learning experience through eye tracking. *British Journal of Educational Technology*, *38*(3), 538–542. doi:10.1111/j.1467-8535.2007.00721.x

Anand, V. (2007). A study of time management: The correlation between video game usage and academic performance markers. *Cyberpsychology & Behavior*, *10*(4), 552–559. doi:10.1089/cpb.2007.9991

Andersson, P., & Fejes, A. (2005). Recognition Of Prior Learning As A Technique For Fabricating The Adult Learner: A genealogical analysis on Swedish adult education policy. *Journal of Education Policy*, *20*(5), 595–613. doi:10.1080/02680930500222436

Balcytiene, A. (1999). Exploring individual processes of knowledge construction with hypertext. *Instructional Science*, *27*, 303–328. doi:10.1007/BF00897324

Beldarrain, Y. (2006). Distance education trends: Integrating new technologies to foster student interaction and collaboration. *Distance Education*, *27*(2), 139–153. doi:10.1080/01587910600789498

Bennett, S., Maton, K., & Kervin, L. (2008). The 'digital natives' debate: A critical review of the evidence. *British Journal of Educational Technology*, *39*(5), 775–786. doi:10.1111/j.1467-8535.2007.00793.x

ChanLin, L-J. (2009). Applying Motivational Analysis in a Web-based Course. *Innovations in Education and Teaching International*, *46*(1), 91–103. doi:10.1080/14703290802646123

Chou, C., Condron, L., & Belland, J. C. (2005). A review of the research on Internet addiction. *Educational Psychology Review*, *17*(4), 363–388. doi:10.1007/s10648-005-8138-1

Colardyn, D., & Bjornavold, J. (2004). Validation of Formal, Non-Formal and Informal Learning: Policy and practices in EU Member States. *European Journal of Education*, *39*(1), 69–89. doi:10.1111/j.0141-8211.2004.00167.x

Collins, A., & Halverson, R. (2009). *Rethinking Education in the Age of Technology*. New York: Teachers College Press.

Cummings, R. (2003). *Equivalent assessment: Achievable reality or pipedream.* Paper presented at ATN Education and Assessment Conference. Retrieved May 11, 2008, as Word Document from http://www.unisa.edu.au/.

Cunningham, D. J., Duffy, T. M., & Knuth, R. A. (1993). The textbook of the future. In McKnight, C., Dillon, A., & Richardson, J. (Eds.), *Hypertext: A psychological perspective* (pp. 19–49). New York: Ellis Horwood.

Donnerstein, E. (2002). The Internet. In Strasburger, V. C., & Wilson, B. J. (Eds.), *Children, adolescents & the media* (pp. 301–321). Thousand Oaks, CA: Sage.

Dwight, J., & Garrison, J. (2003). A manifesto for instructional technology: Hyperpedagogy. *Teachers College Record*, *105*(5), 699–728. doi:10.1111/1467-9620.00265

Eijkman, H. (2009). The Epistemology War: Wikipedia, Web 2.0, The Academy, And The Battle Over The Nature And Authority Of Knowledge. Ken Fernstrom (Ed.), *Readings in Technology and Education: Proceedings of ICICTE 2009* (pp. 516-529). Abbotsford B.C., Canada: UCFV Press.

Eraut, M. (2000). Non-Formal Learning, Implicit Learning and Tacit Knowledge in Professional Work. In Coffield, F. (Ed.), *The Necessity of Informal Learning* (pp. 12–31). Bristol, UK: Policy Press.

Eurostat News Release 146/2006, 1-3. Nearly half of individuals in the EU25 used the internet at least once a week in 2006. Luxembourg: Eurostat Press Office.

Gaggi, S. (1997). *From text to hypertext: Decentering the subject in fiction, film, the visual arts, and electronic media*. Philadelphia, PA: University of Pennsylvania Press.

Gail, J., & Hannafin, M. (1994). A framework for the study of hypertext. *Instructional Science*, *22*(3), 207–232. doi:10.1007/BF00892243

Gee, J. P. (2003). *What video games have to teach us about learning and literacy*. New York: Palgrave Macmillan.

Gorard, S., Fevre, R., & Rees, G. (1999). The apparent decline of informal learning. *Oxford Review of Education*, *15*(4), 437–454. doi:10.1080/0305498991039 19

Graff, G. (2005). Differences in concept mapping, hypertext architecture, and the analyst–intuition dimension of cognitive style. *Educational Psychology*, *25*(4), 409–422. doi:10.1080/01443410500041813

Greenfield, D. N. (1999). *Virtual addiction: Help for netheads, cyberfreaks, and those who love them*. Oakland, CA: New Harbinger Publications.

Greenfield, P. M., deWinstanley, P., Kilpatrick, H., & Kaye, D. (1994). Action video games and informal education: Effects on strategies for dividing visual attention. *Journal of Applied Developmental Psychology*, *15*, 105–123. doi:10.1016/0193-3973(94)90008-6

Hargreaves, J. (2006). *Recognition of Prior Learning: At a glance*. Adelaide, Australia: National Centre for Vocational Education Research.

Herther, N. K. (2009). The Changing Language of Search Part 1.Nu Speak. *Searcher*, *17*(1), 36–41.

Hutchinson, D. (2007). Video games and the pedagogy of place. *Social Studies*, *98*(1), 35–40. doi:10.3200/TSSS.98.1.35-40

Katz, R., & Oblinger, D. (Eds.). (2000). *The "e" is for everything: Ecommerce, e-business, and e-learning in the future of higher education*. San Francisco, CA: Jossey-Bass.

Landow, G. P. (2006). *Hypertext 3.0: Critical theory and new media in an era of globalization*. Baltimore, MD: Johns Hopkins University Press.

Livingstone, D. W. (2001). *Adults' Informal Learning: Definitions, Findings, Gaps and Future Research*. NALL Working Paper 21. Toronto, Canada: Centre for the Study of Education and Work.

Lööf, A. (2008). *Eurostat: Data in focus* 46/2008.

Mallia, G. (2003). Pushing media democracy: Giving marginalized illiterates a new literacy. In K. Fernstrom (Ed.), *4th ICICTE Proceedings* (pp. 387–392). Athens: National and Kapodistrian University of Athens.

Mallia, G. (2007). A Tolling Bell for Institutions? Speculations on student information processing and effects on accredited learning. In *Readings in Technology in Education* (pp. 24–32). Abbotsford, BC, Canada: UCFV Press.

Mallia, G. (2009). Transfer through Learning Flexibility and Hypertextuality. In Wheeler, S. (Ed.), *Connected Minds, Emerging Cultures: Cybercultures in Online Learning* (pp. 185–208). Charlotte, N.C.: Information Age Publishing.

Mancini, C. (2005). *Cinematic hypertext: Investigating a new paradigm*. Amsterdam: IOS Press.

Marsh, J., Brooks, G., Hughes, J., Ritchie, L., Roberts, S., & Wright, K. (2005). *Digital beginnings: Young children's use of popular culture, media and new technologies*. Sheffield: University of Sheffield. doi:10.4324/9780203420324

McKay, S., Thurlow, C., & Toomey Zimmerman, H. (2005). Wired whizzes or techno slaves? Teens and their emergent communication technologies. In Williams, A., & Thurlow, C. (Eds.), *Talking adolescence: Perspectives on communication in the teenage years* (pp. 185–203). New York: Peter Lang.

Milheim, K. L. (2007). Influence of technology on informal learning. *Adult Basic Education and Literacy Journal*, *1*(1), 21–26.

Niederhauser, D. S., & Shapiro, A. (2003, April). Learner Variables Associated with Reading and Learning in a Hypertext Environment. Paper presented at the meeting of the *American Educational Research Association*, Chicago, IL.

NSO. (2008). *Nso News Release. December 15, 2008*. Malta: National Statistics Office.

Ozcelik, E., & Yildirim, S. (2005). Factors influencing the use of cognitive tools in Web-based learning environments: A case study. *The Quarterly Review of Distance Education*, *6*(4), 295–308.

Perry, M. (2003). Distributed cognition. In Carroll, J. M. (Ed.), *HCI models, theories, and frameworks: Toward a multidisciplinary science* (pp. 193–222). San Francisco, CA: Martin Kaufmann. doi:10.1016/B978-155860808-5/50008-3

Pitman, T. (2009). Recognition of Prior Learning: The accelerated rate of change in Australian universities. *Higher Education Research & Development*, *28*(2), 227–240. doi:10.1080/07294360902725082

Pouget, M., & Osborne, M. (2004). Accreditation or *Validation* of Prior Experiential Learning: Knowledge and *savoirs* in France – a different perspective? *Studies in Continuing Education*, *26*(1), 45–66. doi:10.1080/158037042000199452

Prensky, M. (2001). Digital Natives, Digital Immigrants. *Horizon*, *9*(5), 1–6. doi:10.1108/10748120110424816

Prensky, M. (2007). *Digital Game-Based Learning*. New York: McGraw-Hill.

Richardson, W. (2004). Personal mail to Stephen Downes, quoted in Educational Blogging. *EDUCAUSE Review*, *39*(5), 14–26.

Riding, R., & Rayner, S. (1998). *Cognitive styles and learning strategies: Understanding Style differences in learning and behaviour*. London: David Fulton Publishers.

Rouet, J. F., & Levonen, J. J. (1996). Studying and learning with hypertext: Empirical studies and their implications. In Rouet, J.-F. (Eds.), *Hypertext and cognition* (pp. 9–24). Mahwah, NJ: Lawrence Erlbaum Associates.

Salonius-Pasternak, D. E., & Gelfond, H. S. (2005). The next level of research on electronic play: Potential benefits and contextual influences for children and adolescents. *Human Technology*, *1*, 5–22.

Sang Hyun, K., Holmes, K., & Mims, C. (2005). Opening a dialogue on the new technologies in education. *TechTrends: Linking Research & Practice to Improve Learning*, *49*(3), 54–89.

Schneider, R. (2005). Hypertext narrative and the reader: A view from cognitive theory. *European Journal of English Studies*, *9*(2), 197–208. doi:10.1080/13825570500172067

Schugurensky, D. (2000). *The Forms of Informal Learning: Towards a Conceptualization of the Field.* NALL Working Paper 19. Toronto, Canada: Centre for the Study of Education and Work.

Selwyn, N., Gorard, S., & Furlong, J. (2006). Adults' use of computers and the Internet for self-education. *Studies in the Education of Adults*, *38*(2), 141–159.

Shaffer, D. W. (2006). *How Computer Games Help Children Learn*. New York: Palgrave Macmillan. doi:10.1057/9780230601994

Shapiro, A., & Niederhauser, D. (2004). Learning from hypertext: Research issues and findings. In Jonassen, D. (Ed.), *Handbook of research for educational communications and technology* (2nd ed., pp. 605–620). Mahwah, NJ: Lawrence Erlbaum Associates.

Shapiro, A. M. (1998). Promoting active learning: The role of system structure in learning from hypertext. *Human-Computer Interaction*, *13*(1), 1–35. doi:10.1207/s15327051hci1301_1

Shapiro, A. M. (1999). The relevance of hierarchies to learning biology from hypertext. *Journal of the Learning Sciences*, *8*(2), 215–243. doi:10.1207/s15327809jls0802_2

Shneiderman, B., & Kiersley, G. (1989). *Hypertext hands on!* New York: Addison-Wesley.

Spiro, R. J., Feltovich, P. J., Jacobson, M. J., & Coulson, R. L. (1991). Cognitive flexibility, constructivism, and hypertext: Random access instruction for advanced knowledge acquisition in ill-structured domains. *Educational Technology*, *5*, 24–33.

Sweller, J., van Merrienboer, J. G., & Paas, F. G. (1998). Cognitive architecture and instructional design. *Educational Psychology Review*, *10*(3), 251–296. doi:10.1023/A:1022193728205

Tuschling, A., & Engemann, C. (2006). From education to lifelong learning: The emerging regime of learning in the European Union. *Educational Philosophy and Theory*, *38*(4), 451–469. doi:10.1111/j.1469-5812.2006.00204.x

Wheeler, S. (2007). Learning with "e"s: Defining technology supported e-learning within a knowledge economy. In Fernstrom, K. (Ed.), *Readings in Technology in Education* (pp. 306–312). Abbotsford, BC: UCFV Press.

Williams, K. (2003). *Why I (still) want my MTV: Music video and aesthetic communication*. Cresskill, NJ: Hampton Press.

Wood, R. T. A., Griffiths, M. D., & Parke, A. (2007). Experiences of time loss among videogame players: An empirical study. *Cyberpsychology & Behavior*, *10*(1), 38–44. doi:10.1089/cpb.2006.9994

Young, K. (2009). Understanding Online Gaming Addiction and Treatment Issues for Adolescents. *The American Journal of Family Therapy*, *37*(5), 355–372. doi:10.1080/01926180902942191

Young, M. (2007). Qualifications frameworks: Some conceptual issues. *European Journal of Education*, *42*(4), 445–457. doi:10.1111/j.1465-3435.2007.00323.x

KEY TERMS AND DEFINITIONS

Information Processing: The psychological process whereby information is coded, processed, memorized, retrieved and utilized.

Institutionalized Education: School-based education, ranging from early schools to University teaching and learning. The offshoot of institutionalized Education is often summative and based on an accreditation system.

New Media Technologies: Communication technologies that are more often than not computer based, using the world wide web as a means of communicating information. Mobile technologies and interactive gaming also form part of what can be referred to as New Media Technologies.

Immersed Technology Usage: Refers to those that dedicate a large percentage of waking time to the use of technology. There is often, though not necessarily, an addiction to the use, and change in processing makeup and socialization practices often result from the immersion.

Hypertextual Processing (HTP): The result of persistent New Media Technology immersion, and which organizes perceived information into an erratic, loosely grouped number of simultaneous focal points resulting in coherent, if sporadic, information gain.

Independently-Ued, Flexible Learning Environments (IUFLEs): Often as distinct from institution-based, formal educational environments, these environments are populated by on-a-whim searches for information and that provide for incidental learning.

Independent Learning: Learning of which the learner takes charge. It can be formal learning that is done independently by the learner, or informal learning determined and indulged in persistently or intermittently by the learner.

Flexible Learning: Self-paced learning the parameters of which are determined by the learner. The flexibility can be in the time when to learn and for how long, and in the content undertaken. If the flexible approach is from the teaching side, this could apply to instructional methodologies and resources, as well as in delivery.

Digital Natives: A phrase coined by Prensky in 2001 that refers to those for whom digital technologies already existed before they were born. This is counterbalanced by the phrase (also coined by Prensky) Digital Immigrants, that refers to those who came into digital technologies later in life.

ENDNOTES

[1] Parts of this chapter are based on a paper published in the electronic journal UFV Research Review. Other parts are based on a paper presented at the CELDA 2009 Rome Conference.

[2] Quoting the Commission of the European Union, 2000.

[3] Text used here comes from a review of the book by K. Brittain McKee (2004) in *Journalism and Mass Communication Quarterly, 81*(3), 718-720.