Postmodernism, Poststructuralism and ICT in Education: Spectres in a Virtual World?

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Introduction

In my role as Group ICT Director of the United Learning Trust, I have responsibility for the strategic development of the use of Information and Communications technology (ICT) in our Academies. These are schools that are established in conjunction with the Department for Education and Skills in areas of high social deprivation and perceived low educational standards. The use of ICT is a key element of the strategy to improve the educational opportunities for students in these areas and there is the constant need to reflect on the impact of ICT in an educational context. The exploration of postmodernism and poststructuralist thought is relevant to this context of ICT, and may assist our understanding of where the educational use of ICT is placed at this time, and how it may influence the future (and vice versa). In the context of the Trust's work in the use of ICT, and especially Internet-based technologies in education, there is an immediate resonance as the unfamiliar names, challenging ideas and apparently subversive concepts of postmodernism connect in a compelling way to the development of ICT and its role in learning. The *spectres in the virtual world* to which the title alludes are the changing, uncertain and occasionally subversive elements of ICT that haunt education, making their presence felt but often not fully impacting on teaching and learning due in part to the sometimes necessary restrictions imposed in the learning environment, especially schools. An example of this is the uneven and sometimes nervous use of the Internet in the school curriculum. This essay explores some of the ways in which postmodernism and post-structuralism relate to the educational use of ICT. The spectre in the title also refers to one of the two "realities" that can be seen in the use of ICT in education. This spectre, characterised by the Internet, is a virtual simulacrum that can make the other "real" reality seem vague and elusive by comparison.

In relation to both prevalent notions of postmodernism and poststructuralist thought, the essay will explore recent developments in ICT in education and will critically examine the principles that govern these developments and suggest improvements for policy and practice as appropriate. For the purposes of this essay, the discussion of ICT in education will be confined to those technologies (both Information and Communications) that are either directly Internet based or use Internet Protocol (IP) as the main vehicle for their delivery. These include, amongst others, the World Wide Web, content-based online systems, collaboration tools, email, online chat, messaging, videoconferencing and interactive learning systems as well as generic or student-targeted search engines such as Google or Yahooligans. As for the hardware, I include the devices that deliver the above technologies whether they are desktop or laptop computers, personal digital assistants, interactive television, Internet kiosks or smartphones. Incidentally, there is an increasing convergence towards hardware that is small, portable, wireless, ubiquitous and personal, all of which factors will help define the educational use of ICT as part of what characterises the postmodern context.

Postmodernism

There is a riddle which goes like this:

What do you get if you cross the Godfather with a postmodernist?
Someone who makes you an offer that you cannot really understand.

Notwithstanding the flippancy of the riddle there is a genuine perception in much of the literature that I have read on postmodernism in education that the concepts involved are difficult to penetrate. Jerry Wellington states that postmodernism is "a widely used term, impossible to define, encompassing a broad range of amorphous ideas" (Wellington 2000 p199). Likewise Paul Standish declares "'Postmodern educational theory' has become common in educational research, but it is a regret that to an extent this usage is vague and burdened with misleading assumptions" (Standish 2004, p 489). Reference to postmodernism in education causes problems- it has become a loosely used cliché, and it has no direct philosophical place in time as it has with art, architecture, fiction etc. I will therefore deliberately try and take a simple approach in order to try and avoid falling into the above traps. In postmodernism the uncertainty of things is reflected by the development of ICT, where technology moves in unexpected directions presenting new challenges and opportunities at every turn.

It has been said that postmodernism can be seen as the "end of philosophical delusion" (Grassie 1997 p1). There are no monolithic realities and one needs different theories to explain different things. This can again be directly related to developments in ICT as explored later. In a sense postmodernism is a critique on metanarratives and the concept of universal truths where the foundations of our very thinking can be challenged and questioned. But what was the world like before postmodernism? Modernism can be equated with the scientific, Western view most typically represented by the Enlightenment of the 18th Century, where human reason was seen as overcoming irrationality. It was the beginning of an age of perceived certainty. But without the insights and theories evolving from modernism there would be no postmodernism.

However, writers such as Paul Standish prefer the term "poststructuralist" to postmodern as it more directly refers to the thinking of specific writers such as Derrida, Foucault, Levinas and Lyotard (Standish 2004). He also differentiates between 'postmodernity' as a period of time that is defined by the prevalence of ICT, virtuality etc. and postmodernism (ideas and activities influenced by the poststructuralist thinkers). Predominantly, this essay will take poststructuralism as its reference point.

Poststructuralism

Of poststructuralism, it can be seen that all perceptions, concepts and claims to truth are constructed in language. All subject positions are transient and based on cultural discourses influenced by a number of factors including language, which is seen as a system of relationships and differences.

One of the elements of poststructuralism is deconstruction, where language is open to development and text unravels thereby finding different threads of meaning which then reconnect. This unravelling can create new things. The dynamic and spontaneous use of interactive and synchronous IP systems is an extreme example of this in education where writing is not just a respository of information but becomes a tool of interaction and, with the addition of hypertextual elements, creates meaning within its own meaning. Often unmoderated, and this itself presents challenges explored later, the use of messaging, Internet chatrooms and interactive applications are examples of

communication where the author, the text itself and the reader contribute new layers of meaning spontaneously, often anonymously and over distances.
Deconstruction, however can be used at deeper levels than this. To critically analyse a previously accepted educational, or indeed any social scientific theory, one 'deconstructs' the basis upon which it is founded by showing that this foundation is actually the end product of some other cause. Sometimes the connections are shown to be tenuous. For instance, many applications of ICT in a Managed Learning Environment (MLE) may at first view seem to be progressive, radical and pedagogically innovative. However, they are often are based on strict, almost positivist models of learning as the original use of MLEs was in the military to train personnel how to quickly master the skills of complex and dangerous machinery in a virtual way. The addition of colour, multimedia and attractive packaging does not necessarily lend itself to, for instance, use in a literacy class where the models of learning upon which the teaching is assumed to be based are actually different, if not diametrically opposed. But, a great deal of ICT usage in education is in the eye of the beholder. All experience of reality is subject to interpretation and this interpretation is in turn influenced by the cultural and personal values of the interpreter. These interpretations and their associated issue can be seen as being related to the classical discipline of hermeneutics, which, although having its roots in a pre-digital past, has become a paradigm for understanding postmodernism and which also has relevancy to the use of ICT in education.

The hermeneutic approach examines the intentional construction of the author, the textual meanings that exist independently of the author and the reader's presuppositions that will influence the way in which the text will be understood. This can be extrapolated to the area of ICT in education where even greater degrees of hermeneutic complexity can be added, as the organic dialogue of Internet-based communications crosses language, cultural, age, demographic and sociological boundaries. Ricoeur explains hermeneutics as a circular problem with prejudgement directing exploration, which in turn determines understanding before informing prejudgement yet again (Ricoeur 1986). The instantaneous nature and spontaneity of ICT-based written communication can be seen is this context, especially in the synchronous world of messaging and virtual chat where the written word is exchanged more rapidly than in any other form of textual interchange.

Due to the anarchic and unmoderated nature of IP-based communications, there are always potential surprises to be discovered in the method of communication and the content itself. Dillon says, "For poststructuralist thinkers, not only is there more to life than meets the eye, that 'more' is never something that will ultimately make its appearance in the domain of representation" (Dillon 2000, p15).

Again, examples of this type of paradox can be apparent in the use of ICT in education where the distinction between what is real and what is simulated often becomes difficult to maintain, especially in the virtual world of the Internet.

Developments in ICT in Education

There are at least two ways in which "Developments in ICT in Education" can be interpreted. There are the developments in ICT (in education) per se, and there are the developments in the application of ICT within the educational context. An interesting

observation is the fact that education (teaching and learning) can drive the usage of ICT, but also that ICT has the power to drive education. It is easy to resist the latter, arguing that ICT is "just a tool" but to a certain extent this does not acknowledge how ICT can change education itself when it is seen as a potentially subversive phenomenon that challenges the way in which education is "delivered" in the classroom.

One of the difficulties of describing future developments in ICT in education lies in the fact that the hardware and software upon which the developments will be based have not yet been invented and the uses to which the technology will be put have not been developed. Based on current technological trends however, we can anticipate that the future will focus on Internet-based technologies and ubiquitous, small, personal, wireless devices for communication, content creation, interpretation and absorption. These characteristics will present new challenges and opportunities for teaching and learning. Le Cornu et al describe how "ICT opened up new places and spaces for learning to teach, and thus, new opportunities for serious pedagogical engagement" (Le Cornu, Mayer and White 2001, p1). These opportunities will constantly be re-invented in a perpetually contemporary technological world and will lead to the development of principles that will help describe approaches and attitudes.

Aviram and Tami (2001) describe some developing principles for ICT in education and discuss the associated approaches and attitudes. The approaches have been described as falling into a number of categories. The didactic approach states that ICT will bring about inevitable change, the organisational approach states that ICT will bring about organisational change whereas the systemic approach describes how nothing will change until systems change. In postmodern terms however, the cultural approach shows how ICT will have a powerful impact on our lives and is generally part of the fabric of cultural change. A more extreme approach is the ideological one where the basic prevailing values are challenged.

Associated with these approaches are a number of attitudes with which one may approach developments of ICT in education. Attitudes may be agnostic with no clear opinion, conservative where one believes that they may survive ICT with minimal change or moderate where one is prepared to change for the sake of integration. More far-reaching poststructuralist attitudes can be radical, implying a change in relationships and a change of one's reliance on space and time or even extreme radical, where developments in ICT can be seen as potentially destroying prevailing educational systems from within. Taking the above approaches and attitudes there can be seen three emerging paradigms of ICT and education; the technocratic where there is no discussion on educational change, reformist where ICT is regarded as a tool in education or holistic where ICT is seen as an agent of cultural change. Given the directions of technological change, the rapidity at which young people become immersed in the technology and the slowness of teaching structures and learning systems to respond I believe that we may be heading towards a future of immense cultural change where learners become increasingly empowered. Hernwell believes that "children in this postmodern age are the active users of media of the second media age, where they at the same time can be receivers, readers and produces of messages or information" (Hernwell 1999, p1)

Cultural and Epistemological Relativism

Given these potentially radical cultural changes, our perceptions of knowledge may be opening to radical re-interpretation. Epistemology is the theory of knowledge and "in modern, Western societies schooling is invariably organised as an epistemological practice" (Osberg and Biesta 2003, p83).

However, future developments of ICT in education indicate that everything may be open to interpretation, including our perceptions of knowledge which may be relative to our various positions. Farrago describes a type of epistemological relativism (Farrago 2002) where there is no knowledge, just beliefs. Some writers also believe that "more particularly there is held to be a correspondence between the way that people understand the process of knowing and the way they justify their beliefs" (Knight and Collins 2001, p 2). Knight and Collins also state that "relativists take the very act of holding a belief as justification for that belief" (Knight and Collibns 2001, p 3).

This again has relevance to the use of IP-based technologies in education where the unmoderated nature of the World Wide Web presents some ethical and moral and epistemological challenges in education. The postmodern context particularly presents a challenge when it comes to moral or ethical applications of ICT in education, where educators have a duty of care to their students that can often be only made explicit by the imposition of narrowly-defined and non-negotiable safeguards. An example of this is the use of filtering, caching, monitoring and censoring tools for the use of the Internet. Although this can be seen as manipulating children's use of the Internet into a set framework, there is clearly a need to ensure children's safety and to put in place appropriate barriers. This is based on an implicit moral understanding in schools. Knight and Collins make a similar case, stating that "relativism about morals is dangerous" (Knight and Collins 2001, p5). A similar but separate argument can be made regarding the moderation of Internet-based content. Knight and Collins also state that "relativism about empirical or scientific knowledge too, is false" (Knight and Collins 2001, p7). This too needs to be considered, where children as learners need some degree of certainty in their acquisition of knowledge. To present some education as immutable and implicitly true may be necessary, especially with younger children, to provide the scaffolding for their education. This is partially the reason why the use of intranets is becoming more prevalent in schools. They provide a more controlled, focussed and structured version of the Internet. In this way, the virtual world can be contained to a limited extent.

The spectres of these virtual worlds however, can also be ourselves. Mannheim argues that the world created itself only in reference to the subject. If one wishes to see how this reference functions, one needs to look at oneself as just another subject of this reference (Mannheim 1985). This is at the core of Mannheim's relativism; a subject who cannot avoid individualisation- but at the same time cannot be alone. The use of the Internet in education is rich in examples of this seeming paradox; a virtual environment that exists nowhere but is omnipresent, in which an individual can exist as a unique avatar (or number of avatars) in communities that are constantly cross-pollinating, cross-referencing, spontaneously coming into existence, flourishing, dying and creating new hybrids. Not only does the existence of an objective reality become contentious but one's identity within this world is also fluid. Personal identity itself becomes a topic for debate.

Personal Identity and Narrative

With the use of IP-based technologies in education, the distinction between the individual and the technology, and between nature and technology is blurring. This is taking place partially because of the use of chat rooms, multiple avatars and the use by children of email, simulation and role playing. The ICT and the learner can share and exchange identities, take on different facets of postmodern multiple identities or even create new, virtual identities. In many role-playing educational software applications children are actively encouraged to play with virtual identities as they do in other forms of their play. Turkle explored the concept of virtual identity more than 20 years ago (Turkle, 1984), before the advent of the World Wide Web, chat rooms etc. This is even more relevant today.

Despite ethical and safety issues about the use of IP-based technologies for education it may be also seen that "learners utilise best by doing, and their thinking can be seen as related to their engagement in action in the context of ICT usage" (Lahti and Marjomaa 2002, p 1). ICT is an integral part of the educational experience and children's exposure to ICT outside the school should be built upon and exploited in a positive way.

Language and Power

One of the features of postmodernism is the way in which language, text and symbols are seen. Postmodernists such as Baudrillard (1994) describe how the world is mediated by signs and symbols. ICT is predominantly about the manipulation of these elements in a digital way. Both asynchronous and synchronous communication in ICT uses the symbols of communication (both alpha-numeric and iconic) to create layers of meaning that shift and change across the networks. The capability of IP-based technology to transmit written, spoken, pictographic and video-based language adds potential degrees of complexity to the communicated message and to the message of communication. The locus of power too, constantly shifts according to who creates, transmits, receives, interprets, distributes or edits the message.

IP-based technologies confront the relationship between language and power. This is important in a world where some writers believe that "…..the language of education is also under threat of becoming 'irrelevant' in a highly technocratic world" (Webster 2002, p1). The shifting locus of control between the "teacher" and "learner", the "lecturer" and "student" within the context of the Internet is challenging the traditional relationships. The terms themselves can be seen as being under siege. Le Cornu et al claim that "Dichotomous terminology reinforces bounded and unhelpful distinctions which seem to create barriers to professional learning for all participants in the practicum and perpetuates modernist views of learning" " (Le Cornu, Mayer and White 2001, p3).

Current debates on education should challenge any concept of "teaching" that implies a one-way, bounded relationship and an implicit metanarrative about education. Postmodern concepts blur the traditional boundaries of roles, space and time. Concepts such as teacher/student, school/not-school and school-ltime/home-time are also increasingly challenged by IP-based technologies and the opportunities they present for shifting the locus of control, the place and the time of learning. ICT

especially allows all participants in education to move in and out of roles- students teaching teachers, teachers teaching teachers, teachers teaching students, students teaching students and most important, independent learning where the learners teach themselves. All participants in the world of education are ultimately learners. Roles change constantly creating new, hybridised educational relationships. Increasingly, we see all participants learning by doing. ICT creates new learning spaces within which this can happen. Within these learning spaces, there can be a shift of social power and therefore a change in the value of one participant's view interpretation over another.

The criteria for evaluating the value of one interpretation over another is a reflection of social power. Indeed, knowledge can be defined by power and in some respects regarded as synonymous. This is also explored by Foucault where the complexity, ambiguity and paradoxical nature of knowledge and power is acknowledged (Foucault 1980).

Postmodernism attempts to expose power-knowledge. The inevitability of power-knowledge structures successively arising demonstrates the constant state of change which is the context within which postmodernist thinking takes place. The evolving transient and mutable state of the Internet (and therefore also the Internet in an educational context) reflects this. Indeed, the fluid and non-linear nature of hypertext, itself an integral part of the Internet, disrupts the balance of power, with the narrative moving within and without the text, ultimately uncontrolled by the original authors(s).

Postmodernism is partially characterised by a rejection of the positivist theory of language and a recognition that all forms of communication are internally self-referential. Previously accepted metaphoric language or communication can be reversed. Whereas once, the use of the Internet adopted metaphors from the non-digital and natural world (e.g. "the web", "surfing"), increasingly the world of the Internet has not only entered common vocabulary (e.g. "hyperlink", "blog") but has itself become a metaphor for objects and activities in everyday life, including in teaching and learning. Inevitably the language of the Internet will continue to enrich and distort vocabulary and semantics, with the practice of ICT in education formulating and reformulating theory. Atkinson claims that "postmodern thinking can continue the work of challenging the power relationship between theory and practice" (Atkinson 2000, p 90)

Critique of Governing Principles of ICT Development

Aviram and Comay state that "It is a balanced and dialectical approach that on the one hand conceives ICT as the epitome of the new, inevitable and irreversible culture involving new cognitive, emotional, organisational, social and economic structures (rather than a set of neutral tools). On the other hand, it conceives ICT as being double-edged when judged in light of basic, desired social and educational values (rather than on the automatic manifestation of 'progress' or 'advancement'" (Aviram and Comay 2000, p1).

This approach implies the necessity for a cultural rather than a technological understanding of ICT. It also encourages a critical view of the above in a postmodern society. This presents us with the challenge of channelling of ICT culture into socially responsible and empowering ways, especially in schools and homes. Increasingly, postmodern society will need to rethink its educational objectives in the light of this.

The integration of ICT, education and learning will need to be achieved within a morally and ethically sound framework. Recent research by Atkinson claims that the gap between what parents believe their children are doing on the Internet and what the children are actually doing is wide. For example, in a survey (n=1257), 5% of parents believed that their children had given out information on the Internet that they should not have, whereas 46% of children claimed that such an exchange of information had taken place (Atkinson 2004, p14).

Although schools and systems continue to develop and implement ICT 'solutions' there is a paucity of rational discourse on the subject. This has meant that the same trends have repeated themselves over time within education systems, trends which have focused around performativity and the materialistic acquisition of ICT. This is a trend which is explored, amongst others in a collection of papers edited by Blake and Standish (Blake and Standish 2000). It seems that in some ways, education systems have not learnt from history. Educational ICT 'solutions' have been either evangelical and naïve or cynical and expedient. The ICT industry has responded accordingly with faster, slicker, more futuristic claims, often at the expense of the relationship between the learner and the ICT.

Recent other research into the investigation of 9-19 year olds' use of the Internet has compared girls and boys of different ages, demographic and socio-economic background to examine how the Internet may be transforming children's cultures (Livingstone and Baber 2004). The research combined qualitative interviews and observations with a national survey (n=1511) and concluded that although the educational use of the Internet is the target for investment by schools and schooling systems, children actually see it primarily as a communication medium; one that is mainly about the creation, exchange and interpretation of signs and symbols. However, there is an emerging divide signalling inequalities in the quality of Internet use. If there is a need for policy intervention, this must qualify as one the highest priorities. Increasingly, it is difficult to moderate the quality of Internet information accessed and indeed questionable as to whether we should attempt to do so. Notwithstanding this however, we have a responsibility to children, especially young ones, to expose them to what is true, valid, fair, reliable or morally responsible. The difficulty lies with the limited way in which we can attempt to moderate what is essentially an unmoderated world i.e. the world of the Internet. Blocking and filtering of undesirable sites (e.g. pornography/gambling/hate sites) is difficult enough without having to address the problems of validating views that may, for example present a creationist rather than a Darwinian view of dinosaurs. Livingstone and Bober also believe that "attention is also needed to the distinction between information-based and communication-based uses of the Internet" (Livingstone and Bober 2004, p 413). But can we have it both ways? Is not the communication-based application more powerful than the information-based one because of its interactivity and the shifting locus of power? Is this not why children use it?

ICT can be seen as part of what we mean by postmodernity and the application of postmodern analysis to developments in ICT in education is well-suited due to its pragmatic nature. Indeed ICT can be seen not just as connected to postmodernism but as an integral part of what defines postmodernity. As the "truth" of an interpretation is understood not through direct correspondence to reality but through the practical consequences of its applications, so ICT in education (and specifically those Internet-

based applications) lends itself well to this approach. Many Internet-based educational applications are solutions waiting for problems to solve, so the user will bring their own unique requirement to the Internet, possibly one not previously considered. Historically, there are many examples of this, including chat-rooms, web-based email, videoconferencing, web-logging and a host of Internet Protocol (IP)- based applications waiting to be invented or uncovered. To merely narrowly focus available and emerging technology purely on an existing educational paradigm is also to miss the point. There is no ultimate educational application of the Internet but the potential to increasingly harness a wealth of learning opportunities.

Policy Improvement

Some issues regarding policy improvement have been discussed above, but there are several other issues that need to be considered, not least of which is the fusing of the ICT with concept of knowledge as a commodity. Standish states that "the multi-faceted and much vaunted idea of the 'knowledge economy' has dovetailed with the commodification of knowledge" (Standish 2005, p1). As a primary instrument of knowledge exchange, the Internet itself is a vehicle which increasingly and inevitability classifies and purveys knowledge as a global commodity. Commodification and performativity both present complexities in the area of ICT in education. Smith complains that "education now permits little discussion of ends" (Smith 2002, p6). He implies that educational values, ends and purposes are now redundant and that ultimately it is the market that will triumph. Knowledge as a commodity in this market is something that can be "measured", weighed and given a value. This may be borne out by the heavy reliance by the current administrations' emphasis on league tables, pseudo-scientific data and the reliance thereon, especially in the context of school inspections.

A radical postructuralist viewpoint might say that there is a need to dismantle the dominating and monolithic structures of educational systems that are driven by political and populist imperatives. ICT could certainly have a role in this. A change in power structures could be facilitated by further application of Virtual Learning Environments for learning, and devolved Management Information Systems for schools to manage their own data on student learning. As previously discussed, there is an imperative for a change in the relationship between the "teacher" and the "learner", one which will empower all parties. As ICT continues to pervade education so there may be a continuing break-down of the artificial barriers between theory and practice. Elements of action research are already assisting with this in areas of both primary and secondary education. The teacher as a learner, the learner as a researcher and the emergence of grounded theory in the classroom are evident in the use of ICT where new, digital innovations for learning and teaching are emerging from the learning and teaching interface itself.

Curriculum developers may also come to acknowledge that knowledge is not immutably fixed within the curriculum but is subject to organic change, especially on the World Wide Web. Along with this may come the acceptance that scientific objectivity along with concepts of validity and reliability are always open to (careful) challenge.

Devolution of responsibility to schools with assistive ICT may help break down the artificial and bureaucratic structures of authority such as those set up for inspection, teacher training, curriculum development and examinations and the replacement of those with supportive, enabling agencies that provide guidance and support but recognise that the philosophical foundations upon which they are based will be forever shifting.

Practice Improvement

With the increasing role of ICT in education, we need to rethink assumptions made about emotion and reason and the "playful" nature of IP-based technologies. ICT has an important role to play in expression and in emotional experience in everyday life. Concepts of truth and knowledge are not free of emotional influence and emotional experience can be enhanced through the use of ICT. Emergent examples of this are the use of computer conferencing, interactive video and synchronous/asynchronous interaction using the IP-based technologies described earlier. Real-time streaming video of world and local events also provide added dimensions of emotion and evocation as learners can respond to events as they unfold.

Zembylas and Vrasida describe how "the use of ICT in education may produce a blurred but intense emotional experience" (Zembylas and Vrasida 2004, p 122). They go on to propose that the role of ICT is not a matter of more or newer technology but the development of a pedagogical rationale that is rationally and emotionally influenced by the relationship between reason and emotion in learning and teaching.

As an improvement to practice, it may be time to further open the discourse on methods of assessment and evaluation of student learning. The use of ICT in education challenges the concept of objective assessment, and encourages us to consider descriptive, informative and challenging ways of thinking about the measurement of learning and academic progress.

I believe that in a poststructuralist context, one of the most significant practice changes that ICT in education can bring about is the acknowledgement that all content and views are open to interpretation, perhaps even more so given the organic content of the Internet. However, the issues regarding Internet safety and children reminds us that morality and ethics are not discrete subjects to be taught in isolation but should pervade and be integral to all learning, especially in the use of the Internet at home and in school.

Given the fluid relationship and constantly shifting locus of control when using ICT, the importance of the teacher's role as leading the learner towards the subject is even greater. However, bearing in mind that texts are open to multiple interpretations we are reminded that there is a need to develop teachers' skills so that there is a greater sensitivity to the atmosphere of the learning environment and the multiple roles that are possible within learning spaces. The "teacher's role might be seen as that of 'a conductor of intensity'" (Standish 2004, p497), the electrical metaphor using the subject matter , the teacher and the learner as organic components of the system.

Conclusion

In conclusion, we can also see how the application of ICT in education can be made in the spirit of a Nietzschian emphasis on the intensity of experience, where participants can lose themselves in the flow of an activity, especially using the Internet. This is a world where there are potentially no time constraints, no space constraints and a changing dependency on others. The application of IP-based technologies can be in a creative, independent and even subversive way compared with the structured and controlled environment of the modern classroom where there may be a tacit conformity to accepted structures. McKie describes how "in the 'alternative'postmodern reading of technological advance the new media break down 'unilinear structures' and 'centralized perspectives'. The foundation of established knowledge is undermined" (McKie 2000, p 127). Given the reliance that education systems have on structure, it seems unlikely that this postmodern concept will be embraced by the authorities. As such, it may be that the teachers, researchers and the learners themselves will become the agents of sustained ecological change both of and by the use of ICT in education.

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