Learning to know and share: new technologies and 'literacy'

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Abstract: Within contemporary society, the methods by which individuals create and structure knowledge and understanding and display this for social review are ever expanding. The pace at which new forms of digital communication are being developed necessitates radical and rapid change for education both in response and preparation. Given the English prevalence for an economically determinist orientation for educational outcomes manifest through national policy rhetoric and reform it seems pertinent to ask how learning is to be conceptualised. Accepting the view that education needs to both *transform* and *be transforming*, simple input-output methods by which professionals might judge the veracity or otherwise of learning-teaching moments present themselves as both alluring and inappropriate: alluring due to their simplicity; inappropriate with respect to learner-agency. When such dualisms are allied to new technologies it could be said that the debate takes the form of means-ends; that is, proponents of input-output rhetoric might suggest that the acquisition of technologically oriented skills and behaviours is an educational end in itself, whereas those whose beliefs sit 'other' to this may adopt the position that technological advances are important for what they have to offer as means by which education might achieve its goal of transforming the learner. This paper adopts the latter perspective. By adopting a constructivist viewpoint, it is proposed that new technologies offer exciting ways to understand and repopulate professional discourse on learning and teaching and thus extend debate about teacher activity from simple measures by which individuals can be judged to a position that positions pedagogy as an essentially social construction.
Keywords: teaching, teachers, social constructivism, pedagogy

This paper provides a critique of current pedagogic positions. Using English policy as the basis for examination, it describes how moves from a welfare state to a post-welfare era have sought to reposition teaching as a technical endeavour; the paper argues that ICT developments are part of that which defines such moves. English policy, it argues, identifies teacher activity as the mainstay of educational reform to improve pupil-learning, itself judged through the narrow lens of test-performance. Subsequently, teacher activity in relation to new technologies is presented as a series of competences to be obtained and used, in short, the *use* of ICT becomes a defining feature of 'good teaching'. This position is then countered by a social constructivist examination of the relationship between learning and teaching, which challenges the simple casual model of 'teacher-activity engenders pupil-learning'. In this way, it is suggested that those teacher actions currently deemed 'correct' achieve such status through the social milieu that derives and defines that to be lauded; it is not that certain pedagogic endeavours *are* 'truthful' rather they become so due to the positions reified by policy. Finally, the paper argues that views of teaching might thus be more appropriately understood as a juxtaposition of alternative forms of discourse.

ICT: a defining discourse for education

An aspect of educational reform that receives wide media coverage, cultural observation and political attention is the maximisation of the use of information and communications technology (ICT). The rise of ICT as a central educational tenet denotes one of the most influential change

processes in the last and coming decades (Aviram and Tami, 2004: 1) and describes, as Pelgrum and Anderson (1999) note, an emerging paradigm originating in a desire to better prepare individuals for life beyond school. It potentially provides a meaningful narrative (Postman, 1995) able to guide students in the pursuit of modern-rationalistic, democratic values such as critical thinking and the search for democracy, freedom and social responsibility (Aviram and Tami, 2004).

It is fair to state that ICT has had a powerful defining impact on all aspects of educational life and is part of a series of interrelated discourses which together are changing society from one founded upon the principles of the welfare state to one based in a post-welfare era. ICT may well present the means by which doors can be opened and visions realised so that a new pedagogy might be identified (DfES, 2001), but such realisation requires more than mere pedagogic tinkering. In effect, the advent of new technologies requires pedagogical and institutional reorganisation premised on ethical considerations of the benefits to society and the individual and an understanding that interaction between society, the individual and education is ever shifting and self-invigorating. This presents an ideological frame which requires an examination of the interaction between new technologies and education, a frame which necessitates careful consideration of those basic values that form the societal aims to which education should strive and the ways and means such ends are to be met (Aviram and Tami, 2004). Education needs to attend to a review and revision of current ways of working, for as Barajas *et al* note (2004: 7)

> …as for any other form education, self-development, the added value for society and individual, preparation for life as an active citizen in a democratic society, etc. should be primarily taken into account.

Teacher activity in the post-welfare era

This said, questions remain as to the nature of the redefined educational product. Whilst it is clear that the needs of a post-welfare society present a complex web of requirements and concerns, it is surely the case that as the mechanisms by which knowledge might be created, disseminated, shared, commented upon and used (both for good and for ill) expand, the aims for education require explication and debate. Here we are presented with a curious anomaly however: education has never stood still in its attempts to define and redefine itself. Educational theorising has a history with a wealth of research and thought that has spawned a multitude of variations. It would be unfair to suggest that consensus prevails, but nevertheless the means and ends for education are those which have vexed many and continue to do so.

Currently, though, such means and ends have a certain orientation. An obsession with economic prosperity and growth has engendered a 'production' end for education. While business leaders and governments might well urge educators to strive for greater school effectiveness, it is clear that the adoption of a standards-based education often leaves teachers casualties thereof. They learn to do as they are told (Hargreaves, 2003) and are often left feeling frustrated and constrained, unable to satisfy their desire to be creative and take risks (Hartley, 2006; Wrigley, 2003b). The high-stakes, accountability culture so much a part of government response across the globe in effect teaches both pupils and teachers that externally driven rewards and punishment should be that which engender effort (Shepard, 2000). In turn, teachers are the focus for and of reform as it is they who are judged as most significant in determining the quality and scale of learning (Carnell, 2005).

In England, successive governments have used ever-increasing resources and centralized powers to attempt to raise educational standards by the manipulation of teacher behaviour (Silcock, 2003). More specifically, teachers are judged against test-data analysis, which in turn validates the veracity and legitimacy of the pre-test teaching. It should come as no surprise therefore, to note that the British government has widely disseminated, as best practice, criteria that describe 'effective teaching skills' (Hay McBer, 2000) for use as an observational and inspectorial tool (Wrigley, 2003). These skills whilst *seemingly* generating educational success, in effect promote technical competence in areas such as the management of classroom space and resources, the deployment of support staff, the use of technology and adherence to administrative rules and procedures. This focus on what teachers do, describing their work, is founded upon two, interrelated premises. Firstly, that there is a linear, causal relationship between teaching and learning, that is to say that the *quality* of teacher-activity determines the *amount* of pupil-learning. Secondly, and following from the first, teacher-activity is that which should command time and attention. The particular and specific descriptions of teaching so extolled avoid pointedly conceptual questions in favour of those that scrutinise the direct and deterministic relationship between teacher-activity and pupil-learning. Positioning teaching thus, as a series of competences to be accepted, learned, demonstrated and practiced, is part of a 'low trust, high surveillance culture' (Mahony and Hextall, 2000) whereupon professionality becomes the procurement of technical skills in a manner that can be observed and judged. It is a production line analogy which drives the reform agenda: improve the inputs (more productive and cost effective) and the outputs will, logically, be that much 'better' as well.

Such compulsive obsession with standardisation is not the prerogative of the British government alone however (Hargreaves, 2003: xvii); the Fordist mantra is one that seems to pervade the annals of many, if not all, western educational and indeed political, systems. Whilst certainly a post second world war phenomenon, the late 1980s accelerated this new defining culture for educational reform. In Britain, Thatcherite concerns about the dominance of public sector bureaucracies and associated waste, inefficiency and ineffectiveness drove the re-organisation and re-conceptualisation of educational working practices, policies and funding mechanisms (Tomlinson, 2001; Tucker, 1999). Free-market approaches designed to foster value for money were introduced in an effort to counter previous failures to challenge closely guarded professional assumptions about the nature of work with young people, assumptions which, it was believed led to a failure to meet targets and produce savings (Tucker, 1999): a move towards the post-welfare era.

Since 1997 and the election of New Labour to political power, an obsession with centrally driven attempts to 'raise standards' (Alexander, 2004) seen through the lens of the Third Way and its procurement of a micro-managed, Fordist model of education (Ball, 1999) has furthered the inexorable march of the post-welfare, performativity culture in England. An association between the national need to compete globally and the mantra of excellence, efficiency and effectiveness has fuelled an ever increasing adoption of performance indictors used to indicate progress in educational reform (Hartley, 2006). Problematically, such performance orientations subordinate the needs of the individual learner to the wider needs of the *knowledge economy*: that force of creative destruction which, through the relentless pursuit of profit and self-interest stimulates growth and prosperity often at the expense of social order and social good (Hargreaves, 2003). In effect, *learner* becomes *worker in waiting* and that to be gleaned from

school is that which is seen to be required as celebrated in the commercial world (Tucker, 1999). Indeed, upon taking office the Blair government signalled the view that as many children as possible should be prepared to 'contribute economically' as adults thereby supporting education's new, major role: the improvement of the national economy (Tomlinson, 2001). As Hartley notes:

> In its quest for excellence, [New Labour] has underlined its adherence to a human capital theory of education, where investment in the latter will in the future produce high tax-revenues which can fund the welfare state. But this has meant that the government keeps a tight rein on its expenditure for education, and seeks wherever possible to control its ends and means, in the interests of efficiency (2006:10)

In turn, this narrative obviates deliberation about the historical, cultural, sociological and psychological position teaching might hold and its relationship with and to learning. Gone are questions about intent and ends, replaced instead by steadfast adherence to performance as the ultimate end for education.

ICT and performativity

In relation to ICT and this performativity culture, the British government is clear:

> The evidence of the impact of ICT on standards is strengthening all the time. Research carried out by the British Educational Communications and Technology Agency (BECTa) shows positive correlations between achievement at 11 and the quality of ICT provision in schools. (DfES, 2001: 23)

In response, and as a benchmark against which to judge success, suitably alluring behavioural categorisations such as 'how teachers effectively use ICT' are invented. Duly, within classrooms these acquire an ever increasing resonance in the drive to improve pupil-output with the result that teacher and pupil attention is directed to associated observable outcomes and attendant learning-teaching interactions designed to attain such goals with technology in a supporting role. Increasingly, the systems become unconcerned with the relationship between technology and learning for learning is seen to be nothing more than an output from the input of teaching. As Rubin notes (2002: 1)

> The changing world around us has always forced people to react to it in their daily choices, one way or another, but the profound problem of our age is the rapidity with which this process appears to us. That results in a tendency to lose sight of our essential nature as humans, since various processes of "mechanising consciousness" are going on in our present techno-oriented culture.

Although the above might well manifest in the mediation of policy into the professional workspace, it does not describe the academic field of ICT scholarship and research. Certainly, the advent of new technologies as a socially defining feature has leant its weight to endeavours to define the means and ends for education, but it is certainly not the case that educational debate has merely fallen into line behind the requirements of the digital age. In many respects it is such debate that has driven the technological explosion, for example in the creation of virtual learning environments that attempt to widen access and increase usability. Education has both defined itself by the cyberage but has also, in turn, helped define the cyberage itself. It is noteworthy, though, that not all who comment on the interrelationship between new technology and education do so from positive positions. Apple (1991; 1993) was concerned, for example, that the vagaries of capitalist society would lead teachers to become nothing more than managers of

technological equipment whilst learners are prepared for a life spent as a resource, used and discarded at will.

It is vital therefore, that educational developments are operationalised from an underpinning rationale that enhances democracy, strengthens citizenship and self-development, and fundamentally supports societal value. The need is for an approach to learning and teaching that '…both allows people to cope with the expansion and fragmentation of information, empowers them by preparing them for increasingly demanding everyday practices, and, what is most important, does all this on their own terms' (Rubin, 2002: 2). Education must address the whole person so that s/he might grow as an individual, prepared for life (Drake, 1999). Thus, education must concern itself less with product (the 'quantity' of ICT) and more with process: the ability to locate, collate and summarise information, identify connections and contradictions must all become the centre of a new-technological curriculum (Mumtaz, 2000). The role for the teacher is not about the imparting of knowledge and wisdom via predetermined and prescribed methods, but rather should concern itself with considering the processes of learning (Allebone, 2003).

Towards constructivist critique
In response, many cite constructivism as a means by which education might begin to wrestle with such issues. Increasingly, advocates of new technology-exploiting education are adopting the idea that learners shape their own minds through their own actions within given socio-cultural settings; in orientation, learning as construction. Constructivism, although not originally described with ICT in mind, seems to have found a welcome bedfellow in technological advances and their applications to learning and teaching (Tam, 2000). Although often presented under an umbrella term, constructivism more correctly describes a diversity of discourses that have been clustered together under a common banner (Davis and Sumara, 2003). Although the various positions differ, their family resemblance is conferred by three similarities (Davis and Sumara, 2003). Firstly, all adopt a non-Cartesian position for progress in learning: that is, they all understand learning as fluid and non-linear. Secondly, the dynamics (ranging from the personal to the social) by which such construction is achieved are regarded as the means by which the learner maintains coherence. Thirdly, they reject the assumption that learning is the internalisation of an external reality which predates human cognising and which sits ready to be discovered and understood; constructivist theorising adopts the anti-realist perspective that facts *necessarily* reflect particular points of view.

For many, constructivism provides a position upon which to offer direct teaching advice (see for example Saunders, 1992; Wheatley, 1991; Yager, 1991) and much that is written from such perspectives alludes to professional characteristics to be adopted. Common themes about teachers seem to emerge: as an organiser and but one source of information (Hanley, 1994; Crowther, 1997); as facilitator (Copley, 1992); and as providing support and guidance whilst diagnosing student interpretation to inform and direct further action (Driver *et al*, 1994). Whilst this advice might seem appealing it is worth signalling that by presenting insights into *learning* with all its complexities and subtleties, constructivist discourse denies a simplistic and deterministic relationship between teacher-activity and that which a learner learns. Instead it posits that whilst teaching can and does *assist* pupil-learning, teaching is never the sole determinant thereof (Davis and Sumara, 2003: 130). In this respect, constructivist perspectives

highlight not what teachers must do, but rather what they cannot do; it acts as a modifier, which points to the possible affects teaching might have.

What constructivism therefore requires is a paradigm shift: the abandonment of the familiar to embrace the new (Brooks and Brooks, 1993). In this respect mere acquiescence to constructivist theoretical posturing is problematic: as Von Glasersfeld (1995) notes constructivism is a *description of* not a prescription for learning. More importantly, constructivist underpinnings challenge some of the bedrocks upon which contemporary educational policy is built. Accordingly, as a paradigm its benefits lie in its offerings for critical debate: it diverts attention away from proposals about what teaching should and must look like (Davis and Sumara, 2002) and instead provides a challenge to aspects of educational posturing that purport to establish learning and teaching truisms.

More specifically, adopting a *social-constructivist* position as critique offers illuminating possibilities through its challenge to the acceptance that teachers must and should continue to work within prevailing political, cultural and social discourses, for these discourses are seen to limit explicitly the extent of the teacher-pupil dyad. Social constructivism, as a meta-theoretical position, is concerned with how societal conventions, history and interaction with others inform the mental processes that construct reality in its relationship to the world (Gergen, 1999: 60). It emphasises therefore, the influence of social and cultural contexts in learning with language as that which provides the vehicle for arriving at understanding through a social and collective process (Vygotsky, 1962).

> Based on the premise that knowledge is a socio-linguistic process dependent upon the content and culture where it occurs, this view argues that we use conversational language to negotiate meanings that result in shared knowledge and understandings' (Kanuka and Anderson, 1999: 8, 9)

Thus, in coming to know, learners first develop understanding at a social level (interpsychologically) before such understanding is embedded internally (intrapsychologically); the cultural meanings shared by a group and derived from social interactions are eventually internalised by the individual (Talja, Tuominen and Savolainen, 2005: 85). Potentially though, if, as Heylighen (1993: 2) suggests, ''Truth' or 'reality' will be accorded only to those constructions on which most people of a social group agree', then, potentially the differing social situations in which pupils operate (home, school, peer group, online chat room, etc.) will each have specific and particular nuances upon which to judge. This creation of differing 'domains of knowledge' (Solomon, 1987) presents a key difficulty for education: how is it that we are to bring these together? Furthermore, given that information can be now more easily constructed, presented and accessed in an immediate, digital form, there is potential for increasing numbers of domains of knowledge. Moreover, the possibility that the distances between each knowledge domain become ever greater, education is faced with a greater need to re-contextualise its practice to bridge the divide. In this respect, the performance world of the school, replete with messages about standards and attainment potentially sits in ever increasing opposition to other knowledge domains both due to its narrow narrative and its position as one perspective in an ever increasing number.

Pedagogy, texts and knowledge domains

Thus far, it has been suggested that teacher activity is positioned by wider policy discourses within the post-welfare era. Duly, technologically oriented behaviours by both teacher and pupil is the educational end in and of itself; a quasi-religious technological narrative (Postman, 1995) that commands devotion to the acquisition of technological equipment and skills (Aviram and Tami, 2004: 23). The specifics of the pedagogic social context are defined by power and control relationships at a supra-organisational level; the discourses which frame teacher activity in relation to ICT are *specified* in relation to the preparation of children for life in the information age and *realised* through a simple realignment of teaching methods. The values that shape the context within which the management and expression of teacher activity can occur and thus define the 'ends' for education are those which Wilkinson (2006) describes as secularist business values and materialistic desires. In turn, it is these 'ends' which inexorably describe the direction and ethos of the educational project. In short, the teacher-ICT-education relationship is classified in relation to professional ability to display a pedagogic narrative adequate to the prevailing discourse, which in turn describes the teaching-learning relationship as tightly interwoven and deterministic with ICT relegated to the status of 'tool'.

Conversely, a constructivist critique founded upon a belief that learning is not solely determined by teaching illuminates an alternative perspective. Specifically, the discourse provided by social constructivism poses challenges to the creation and adoption of simple pedagogic truths. By positing that understanding is an interpsychological action it questions the tyranny of those pedagogic perspectives that seek to objectify a specific learning-teaching truism. The ICT-related pedagogic act is seen as positioned by the social milieu, comprehension of which is both representative and demonstrative of aspects of the culture in which it is expressed. Learning-teaching interactions are social, cultural and political events: they represent and in turn define the narrative of the educational process, replete with constructions of right and wrong. Thus, a social constructivist critique sees the presentation of an ICT-rich pedagogic text in a form construed as 'acceptable', as so conferred, not for its ability to describe an objective, one-to-one subject-object relationship, but because the socio-cultural milieu provides the constructions on which the dominant group can agree. It is the milieu surrounding the learning-teaching moment which positions and describes 'correct' teacher-activity and pupil-outcome, not the activity itself. In other words, social constructivism presents the view that learning-teaching 'realities' are positioned responses to wider narratives that in turn create texts replete with recognition and realisation rules that drive the procurement of certain behaviours.

The concerns for education are two-fold. Firstly, pedagogic 'truth' is judged not in relation to an objective reality that exists independently of human cognising, but rather as the product of social interaction and dialogue. Secondly, as new technologies offer ever-increasing domains of knowledge it is important that education understand its position as a narrative-mediator. Its role is not to attempt to explain a series of potentially interrelated and multiform phenomena in decontextualised and independent ways (Rubin, 2002: 2) but rather to bring into focus the rules of categorisation that insulate separate domains of pedagogic knowledge. In this way, greater relevance is given to alternative texts for these constitute legitimate challenges to that which defines the learning-teaching moment. The use of pedagogic knowledge construed as 'other' to acceptable practice is thus repositioned from 'incorrect' to one or both of two things: an alternative attempt to make sense of the classroom socio-cultural milieu; and/or a statement of

positive, professional self-establishment through its rejection of the hegemonic rules for recognition and realisation.

To conclude: potential and problem

Whilst the above might well offer insights into alternative perspectives concerning knowledge and its multiplicity of forms and attendant learning-teaching processes, it is clear, certainly in England that such perspectives run counter to the messages conveyed by the rhetoric of performativity, which, as highlighted, all-too-often result in a simple manipulation of existing teaching-learning viewpoints. As technological advancement and socio-economic development are seen as the determinants of society, teaching and learning are subsequently positioned as a response to the performativity context, itself defined by the perceived need to ensure that individuals are prepared for the wider economy. The language of the social and collaborative process (Vygotsky, 1962) is negotiated from a causal and deterministic perspective with the effect that judgements about the acceptability or otherwise of teacher-activity are made within the domain of school knowledge alone. Opportunities for wider analysis are obviated for they do not provide frames within which performance against clear and 'objective' test-criteria can be judged. Similarly, as new technologies are viewed as necessary for the advancement of society, ICT becomes a fillip to pre-existing teaching-activities, justified through the qualitative upgrade they provide to everyday school practice (Anastasiou *et al*, 2000). In short, this seems to reaffirm Cuban's (1993) view that schools are firmly grounded in a culture that extols the virtues of the student-teacher relationship; the continuing assumption is that whilst new technologies, in a variety of guises, add to the learning process (Strommen and Lincoln, 1992) for learners to learn, teachers must teach. The use of ICT is thus judged through the lens of pre-existing teacher-pupil discourses realised, in turn through the persistence of the nineteenth century age-graded school replete with cultural narratives that shape what teachers can and cannot do and which ultimately seek to adapt innovation to fit with a series of predetermined institutional contours (Cuban, 1993: 186). Once again, the fact that different learners have unevenly distributed economic, cultural and social resources (Rubin, 2002: 1) is left unexamined. The message is simple: technology expands interactivity and the ability to create and share information; its adoption legitimates its use. Thus we see traditional activities 'reinvented' for the technological age in order that previously agreed subject matter might be 'better learnt'.

At its heart, this input-output stance for education locates teacher activity, part, if not most of which requires the use of ICT, as the mainstay of educational effectiveness. Accordingly, the thoroughly modernist project which readily embeds 'teaching', 'teacher', 'classroom', etc. in the drive to determine what is learned (Davis and Sumara, 2003), positions technology as a resource to be deployed to aid teacher-activity. Although ICT is paraded as the means by which learning can be re-conceptualised, learning itself is never actually discussed; it is taken-for-granted that getting teachers to do what they have hitherto done (albeit with new resources), within curriculum constraints that have hitherto existed will somehow make education better able to position learners within the post-welfare, knowledge economy. But this does not follow for as Costa and Liebmann (1995: 23) explain

> If students are to keep pace with the rapid increase of knowledge, we cannot continue to organize curriculum in discrete compartments, the disciplines as we have known them, no longer exist. They are being replaced by human inquiry that draws upon generalized transdisciplinary bodies of knowledge and relationships.

Alternatively, a social constructivist critique offers other perspectives. Through an acknowledgement that the learning-teaching interaction is a socio-cultural construction, this position presents education with alternate conceptions of ICT-related pedagogy. It was shown that rather than simply construe various forms of teacher-activity in terms of 'correctness', we might alternatively understand them as a weakening of the boundaries separating differing domains of pedagogic knowledge. Thus by importing aspects of those idiosyncratic narratives that form part of the teacher-world, we might conclude that practice is, in effect, the juxtaposition of alternate forms of discourse. Thus teacher-activities are representations of struggles to understand tensions between co-existing forms of knowledge; they provide the practical representation of teaching as narrative-mediator. Moreover, as the rise of new technologies pervades every aspect of our lives the ICT-teacher relationship offers ever-increasing numbers of challenges to constructing suitable means for education. The constructivist examination presented above posits that rather than simply reorient teacher activity through the use of ICT, technological advance, through the multiplicity of ways it can create and share knowledge, offers much more: in effect an increasing number of, and access to, alternative learning-teaching conceptions. Thus, teacher activity in relation to the new technological age is best viewed not in relation to how 'well' tools can be used to bolster existing practices but rather for how it can support the creation and sharing of alternative pedagogic narratives. The rise of new technologies presents challenges. For education one of these is to acknowledge the interdependency of learning and teaching as essentially social acts and how such knowledge needs to alter our teacher-activity world-view. In tension though, the post-welfare era presents a tapestry into which such deliberations are increasingly difficult to weave.

References

Alexander, R. (2004) Still no pedagogy? Principle, pragmatism and compliance in primary education, *Cambridge Journal of Education*, *34*(1), 7-33

Allebone, B. (2003) Information or communication? Evaluating the use of an internet on primary education courses, Technology, *Pedagogy and Education*, *12*(2), 231-247

Anastasiou, V., Athanasopoulos, Ch., Sarris, M., Savas, S., Sotiriou, S. A., Tolias, V. (2000). The school of tomorrow: A school open to the world, examples of elements of good practice, paper presented at *Proceedings of the EDEN fourth Open Classroom Conference*, Barcelona, Spain, November 19-21

Apple, M. (1991) The new technology: is it part of the solution or part of the problem in education? *Computers in the Schools*, *8*(1/2/3), 59-81

Apple M. (1993) *Official Knowledge: democratic education in a conservative age*. London: Routledge.

Aviram, R. and Tami, D. (2004) *The impact of ICT on education: the three opposed paradigms, the lacking discourse*, available at http://www.informatik.uni-bremen.de/~mueller/kr-2004/ressources/ict_impact.pdf, [accessed 03/07/06]

Ball, S.J. (1999) Labour, Learning and the Economy: a 'policy sociology' perspective, *Cambridge Journal of Education*, *29*(2), 195-206.

Barajas, M., Paulsen, M.F., Kikis, K., Jones, B., Scheuermann, F and Mirski, P. (2004) *Report on new methods to learning in technology-based environments, and related policy matters: IST and IHP projects related (draft)*, available from http://www.ub.es/euelearning/delphi/docs/3.pdf [accessed3/07/06]

Brooks, J.G. & Brooks, M.G. (1993), *In search of understanding: the case for constructivist classrooms*, Alexandria, VA: American Society for Curriculum Development

Carnell, E. (2005) Understanding and enriching young people's learning: issues, complexities and challenges, *Improving Schools*, *8*(3), 269-284

Copley, J. (1992), The integration of teacher education and technology: a constructivist model, in D. Carey, R. Carey, D. Willis, & J. Willis (Eds.), *Technology and Teacher Education*, Charlottesville, VA: AACE, 681

Costa, A. and Liebmann, R. (1995) Process is as important as content, *Educational Leadership*, *52*(6), 23-24.

Crowther, D. T. (1997), Editorial, *Electronic Journal of Science Education*, *2*(2), http://unr.edu/homepage/jcannon/ejse/ejsev2n2ed.html [accessed 17/1/04]

Cuban, L. (1993) Computers meet classrooms: classrooms wins, *Teachers College Record*, *95*, 185-210

Davis, B. and Sumara, D. (2002) Constructivist discourses and the field of education: problems and possibilities, *Educational Theory*, *52*(4), 409-428

Davis, B. and Sumara, D. (2003) Why aren't they getting this? Working through the regressive myths of constructivist pedagogy, *Teaching Education*, *14*(2), 123-140

Department for Education and Skills (DfES) (2001) *Schools: achieving success* [online], available at http://www.dfes.gov.uk/achievingsuccess [accessed 07/06/06]

Drake, C. (1999) Values education and life-wide learning, paper presented at the *16th Annual Conference of the Hong Kong Educational Research Association*, Hong Kong Institute of Education, Hong Kong, November 20-21 available at
http://www.livingvalues.net/pdf/lvlearning.pdf [accessed on 06/06/06]

Driver, R., Aasoko, H., Leach, J., Mortimer, E. and Scott, P. (1994) Constructing scientific knowledge in the classroom, *Educational Researcher*, *23*(7), 5-12.

Easen, P. and Bolden, D. (2005) Location, location, location: what do league tables really tell us about primary schools?, *Education 3-13*, *33*(3), 49-56.

Edelsky, C. (1994) Education for democracy, *Language Arts*, *71*, April

Gergen, K.J. (1999) *An invitation to social construction*, Sage: London

Hanley, S. (1994) On Constructivism, *Maryland Collaborative for Teacher Preparation*, available at http://www.towson.edu/csme/mctp/Essays/Constructivism.txt [accessed 12/2/04]

Hargreaves, A. (2003) *Teaching in the knowledge society: education in the age of insecurity*, Berkshire: Open University Press

Hartley, D. (2006) Excellence and enjoyment: the logic of a contradiction, *British Journal of Educational Studies*, *54*(1), 3-14.

Hay McBer (2000) *Research into Teacher Effectiveness: a Model of Teacher Effectiveness Report by Hay McBer to the Department for Education and Employment*, London: Department for Education and Employment (DfEE), available at http://www.teachernet.gov.uk/_doc/1487/haymcber.doc [accessed 02/03/01]

Heylighen, F. (1993) Epistemology, introduction, *Principia Cybernetica*, available at http://pcp.vub.ac.be/EPISTEMI.html [accessed 28/09/06]

Kanuka, H. & Anderson, T. (1999) Using Constructivism in Technology-Mediated Learning: Constructing Order out of the Chaos in the Literature, *Radical Pedagogy*, *1*(2), [http://radicalpedagogy.icaap.org/content/issue1_2/02kanuka1_2.html].

Kearns, D. and Doyle, D. (1991) *Winning the brain race: a bold plan to make our schools competitive*, San Francisco: ICS Press.

Mahony, P. and Hextall, I. (2000) *Reconstructing teaching: standards, performance and accountability*, London: RoutledgeFalmer.

Mumtaz, S. (2000) Factors affecting teachers' use of information and communications technology: a review of the literature, *Journal of Information Technology for Teacher Education*, *9*(3), 319-341.

Pelgrum, W.J. and Anderson R.E. (Eds.) (1999) *ICT and the emerging paradigm for lifelong learning: a worldwide educational assessment of infrastructure, goals and practices*, Enschede, The Netherlands: Printpartners Ipskamp.

Postman, N. (1995) *The end of education: redefining the value of the school*, New York: Knopf

Ravitch, D. (1991) A culture in common, *Educational Leadership*, *49*(4), 8-11.

Roy, G. (2005) On sense and nonsense: looking beyond the literacy wars, *Journal of Philosophy of Education*, *39*(1), 99-111.

Rubin, A. (2002) Futures learning: from elearning towards a futures-oriented way of learning, paper presented at *Vision Seminar, Vision Week*, Turku School of Economics, Turku, Finland, June 11-12, available at http://www.tukkk.fi/tutu/Vision/Papers/AnitaRubin.pdf [accessed 9/9/06]

Saunders, W. (1992) The constructivist perspective: implications and teaching strategies for science, *School Science and Mathematics*, *92*(3), 136-141.

Shepard, L. A. (2000) The role of assessment in a learning culture, *Educational Researcher*, *29*(7), 4–14.

Silcock, P. (2003) Accelerated learning: a revolution in teaching method?, *Education 3–13*, *31*(1), 48–52.

Solomon, J. (1987) Social influences on the construction of pupils' understanding of science, *Studies in Science Education*, *14*, 63-82.

Strommen, E.F. and Lincoln, B. (1992) Constructivism, technology and the future of classroom learning, *Education and Urban Society*, *24*, 466-476.

Talja, S., Tuominen, K. and Savolainen, R. (2005) "Isms" in information science: constructivism, collectivism and constructionism, *Journal of Documentation*, *61*(1), 79-101.

Tam, M. (2000) Constructivism, instructional design, and technology: implications for transforming distance learning, *Educational Technology and Society*, *3*(2), 50-60.

Tomlinson, S. (2001) *Education in a post-welfare society*, Buckingham: Open University Press

Tucker, S.A. (1999) Making the Link: Dual 'Problematization', Discourse and Work with Young People, *Journal of Youth Studies*, *2*(3), 283-295.

Von Glasersfeld, E. (1995) *Radical Constructivism a way of knowing and learning*, London: Falmer Press.

Vygotsky, L. S. (1962) *Thought and language*, Cambridge, MA: MIT Press.

Wheatley, G.H. (1991) Constructivist perspectives on science and mathematics learning, *Science Education*, *75*(1), 9-21.

Wilkinson, G. (2006) McSchools for McWorld? Mediating global pressures with a McDonaldizing education policy response, *Cambridge Journal of Education*, *36*(1), 81-98

Wrigley, T. (2003) Is 'School Effectiveness' Anti-Democratic?, *British Journal of Educational Studies*, *51*(2), 89-112.

Yager, R. (1991) The constructivist learning model, towards real reform in science education, *The Science Teacher*, *58*(6), 52-57.