Using online social networking tools to support the continuing professional development of teachers

A paper written as part of a Master of Education course in elearning

By Mark Berthelemy

Capita Learning & Development

February 2006

Last updated: 27/02/2006

Contents

1 Introduction

The DfES National Strategies are rolling out revised frameworks for teaching primary Literacy and Numeracy.[1] These are based on the existing frameworks but have been reorganised to provide explicit links between the frameworks and the guidance materials, and between one year groups' framework objectives and the adjacent year groups'. A number of content areas have also been revised to take account of new thinking.

The materials are being designed to work as an interactive web site, with a minimal amount of paper-based introductory and support materials. The rollout of the materials will be accompanied by a support programme which aims to emphasise the key messages around:

- understanding progression
- planning sequences of lessons
- embedded assessment for learning

The support programme will need to include elements of marketing the revised frameworks (ie. highlighting the features and benefits) as well as helping people to use the revised frameworks effectively.

National Strategies relies on schools taking up the "offer" of support made by local authorities, who in turn are encouraged to take up the support offer from National Strategies. At the moment, local authority-based consultants provide direct support to approximately 25% of schools with indirect support, through subject leaders to the rest.

This paper will examine the ways in which CPD (continuing professional development) currently takes place, the research that provides evidence about effective CPD, and the ways in which an online social-networking environment may be used to support CPD in this context.

---

[1] DfES, "Reviewing the Frameworks for teaching literacy and mathematics", DfES, http://www.standards.dfes.gov.uk/primary/publications/literacy/1200695/, last accessed: 10/2/06

2 The current state

Many large-scale CPD programmes have relied on a cascade model[2], in which a teacher trains a group of "students", who in turn become teachers and train further groups, and so on. In the best examples of the cascade model, it has been a sustainable approach to training[3] which is also cost-effective.[4] The successful examples of the cascade model tend to follow a number of key guidelines:

- The training is experiential and reflective, rather than transmissive
- The training is open to reinterpretation – without any expectation of rigid adherence to prescribed ways of working
- Expertise is diffused through the whole system – not concentrated only at the top
- A cross-section of stakeholders is involved in the preparation of materials[5]

However, experience has shown that making the top-down[6] cascade process work effectively is not easy[7]. It is difficult to ensure that each layer of trainers has an equivalent background of knowledge to call upon, which can thus lead to a dilution of the message from the top, due to the different interpretations, understanding and confidence of the individuals involved.[8] Harland & Kinder have noted that, in many cases, the initial National Literacy Strategy cascade ran into major problems because the people at the receiving end did not necessarily share the same values as the course leaders, and the course leaders were equipped to provide an experience which changed values.[9]

Mathekga has concluded that a top-down approach to in-service training of adults requires a move away from the top-down approach, and a move towards a much more inclusive approach – with "trainees" able to contribute to their own learning.[10]

There is a move away from the cascade, one-size-fits-all approach to CPD, to a much more tailored approach. This move takes into account the impact matrix proposed by Joyce & Showers[11] and the extensions suggested by Harland & Kinder[12].

---

[2] Teaching and Learning Models and Approaches, http://www.bbk.ac.uk/ccs/elearn/teach_and_learn_models.htm#cascade, last accessed: 14/2/06

[3] Burden, K., Cascade ICT training web page, http://www.hull.ac.uk/ces/people/KevinBurden.html, last accessed: 14/2/06

[4] Evans, K. (1990), "Preparing for the 'new INSET': External agency intervention in the management of in-service training and staff development", Research in Education Management and Policy: Retrospect and Prospect, Saran R. and Trafford V (ed), The Flamer Press, New York, cited in Mathekga, A.M. (2005) "The impact of in-service training: A reassessment of the cascade model", MPhil thesis, University of Pretoria

[5] Hayes, D. (2000), "Cascade and training teacher's professional development", English Language Journal; vol. 54 (2); 135-145, cited in Mathekga, A.M. (2005) "The impact of in-service training: A reassessment of the cascade model", MPhil thesis, University of Pretoria

[6] Eraut, M. (1995) "Inservice Education", International Encyclopedia of Teaching and Teacher Education, 2nd edition, Anderson L.W. (ed), Pergamon, Columbia, cited in Mathekga, A.M. (2005) "The impact of in-service training: A reassessment of the cascade model", MPhil thesis, University of Pretoria

[7] Mathematics Assessment Resource Service, Professional Development Support, http://www.nottingham.ac.uk/education/MARS/services/pd.htm, last accessed: 14/2/06

[8] Mathekga, A.M. (2005) ibid

[9] Harland, J. & Kinder, K. (1997) "Teachers' Continuing Professional Development: framing a model of outcomes", British Journal of In-service Education, Vol. 23, No. 1, 1997, pub. Routledge. Available from: http://taylorandfrancis.metapress.com/openurl.asp?genre=article&issn=1367-4587&volume=23&issue=1&spage=71, last accessed: 15/2/06

[10] Mathekga, A.M. (2005) ibid

Level of Impact	General awareness of new skills	Organised knowledge of underlying concepts and theory	Learning of new skills	Application on the job
Training method: Presentation/description (e.g. lecture) of new skills	✓	✓	✓	✓
Modelling the new skills (e.g. live or video demonstrations)		✓	✓	✓
Practice in simulated settings			✓	✓
Feedback on performance in simulated or real settings			✓	✓
Coaching/assistance on the job				✓

Joyce & Showers' (1980) impact matrix[13]

These analyses can help CPD providers to design CPD interventions so they more closely match the CPD with its required outcomes, taking into account the local situation.

It is agreed that such locally designed and implemented CPD is the ideal to meet locally defined needs, yet that still does not help when there is a national values, skills and knowledge agenda (such as the new frameworks) which needs to be rapidly and cost effectively looked at, worked on and implemented. In which case, we perhaps need to look at a model of CPD that more closely matches the real structures and relationships that exist in our local authorities.

---

[11] Joyce, B. & Showers, B. (1980), "Improving in-service training: the messages of research", Educational Leadership, 37, pp. 379-385, cited in Harland & Kinder (1997)

[12] Harland, J. & Kinder, K. (1997) ibid

[13] Joyce & Showers (1980) ibid

3 Networks and Communities of Practice

Professor Albert-Laszlo Barabasi, in his book "Linked"[14], clearly shows how the natural properties of networks are intrinsically part of everyday life and that the structure of networks is "the key to understanding the complex world around us." Every network (in whatever context) has been shown to have properties which follow mathematical rules. If we understand these properties we can exploit them in the way we design systems and processes.

- Networks are simple:
  Any network consists of a set of nodes that are connected by links. Nodes may be land areas connected by bridges (the links), people connected by handshakes, web pages connected by hyperlinks, etc…
- Networks are dynamic:
  Networks are dynamic, ever-changing entities. They grow and decay; attaching and losing nodes, seemingly at random.
- Networks consist of strong and weak ties:
  The strong ties are between those nodes that are closely related, and most tightly interlinked. The weak ties join those groups of nodes to other similarly tight clusters. It is the weak ties that play a crucial role in spreading ideas to the outside world.
- Hubs are critical:
  The hubs are those nodes that have the most links made to them. They are the visible parts of the network. If a hub links to your node, then you, and your ideas, also become visible. Hubs are formed due to the principles of growth and preferential attachment. Networks build through growth - ie. attaching one node at a time. New nodes prefer to attach to the more connected nodes. This natural development of hubs in a network indicates the transition from chaos to order. As hubs develop, the degree of separation between any two nodes dramatically decreases. For example – on the internet, large sites, such as Google or the BBC act as hubs. But also, in specific fields, there will be key hubs – for example, in elearning, one main hub is Stephen Downes' site.
- Nodes have a fitness level:
  In an environment where each node competes for links from other nodes, those that show an ability to gain links are deemed to have a higher level of fitness relative to the other nodes. In a web environment, this may be because that page offers a function or quality of content that no other page offers. Those nodes with high fitness levels can rapidly become hubs, even if they enter the network at a late stage.

The relationships between National Strategies, Local Authorities, Consultants and schools are often formalised as a tree structure, and therefore National Strategies programmes have been developed based around a cascade model which matches the perceived formal relationship structure, with all the advantages and disadvantages that that model entails.

A more realistic structure to use is to treat the relationships as links between nodes in a network, with clusters based around the LEA relationships, and weak links between those clusters, using the subject associations and other networks of consultants, RA's, SMT's and teachers. Etienne Wenger defines this type of network as a community of practice, as it's not just a random set of relationships – instead it has an "identity as a community" which "produces a shared practice as members engage in a collective process of learning."[15]

Wenger argues that it is "this informal fabric of communities and shared practices [which] makes the official organization effective and, indeed, possible."[16] Lesser and Storck[17] have extended this by positing that "the

---

[14] Barabasi, A.-L. (2002). "Linked: The New Science of Networks", Cambridge, Mass.: Perseus Pub.

[15] Wenger, E. (1998), "Communities of Practice: learning as a social system", Systems Thinker, vol 9, issue 5, Pegasus Communications, available from: http://www.co-i-l.com/coil/knowledge-garden/cop/lss.shtml, last accessed: 18/2/06

[16] Wenger, E (1998) ibid.

social capital resident in communities of practice leads to behavioural change – change that results in greater knowledge sharing, which in turn positively influences business performance," where social capital is a measure of "the sum of the actual and potential resources embedded within, available through, and derived from [a] network of relationships"[18] George Siemens in turn, argues that learning itself is a process of network creation, linking the internal networks of our minds with the external networks of our relationships and computer-based systems.[19]

Given this, National Strategies programmes and interventions which develop and maintain social capital[20] in informal communities of practice will have positive impacts. By ensuring the network is as open as possible, ie. allowing links to be made between anyone who has a stake in the community, the impact will be wider reaching and more rapidly achievable.

Lesser & Storck[21] build on the work of Nahapiet & Ghoshal[22] by relating their three dimensions of social capital to communities of practice. Understanding these dimensions may help organisations to explore how best to support the communities of practice that have an impact on the organisation's performance.

3.1 Structural Dimension

"Individuals must perceive themselves as part of a network"[23] To do this, they must be able to make links with other individuals. Any organisation wishing to develop and maintain social capital will need to facilitate and encourage the creation of those links.

3.2 Relational Dimension

To increase social capital, the interpersonal relationships must be developed across the connections. These relationships may be characterised[24] by describing in terms of:

- Obligations – a shared understanding what individuals get out of the relationship
- Norms – a shared set of "common standards of behaviour"[25]
- Trust – awareness of how an individual will react in a given situation
- Identification – a process in which individuals become perceived as united with the group
- This is very close to stage 2 (online socialisation) of Gilly Salmon's 5-stage model for e-moderators[26]. Yet instead of e-moderators working with tightly defined groups of people, a developing community of practice will begin with a small group of individuals who choose to link to each other, and by virtue of the example they offer, set the relational norms and obligations.

---

[17] Lesser, E. L. and Storck, J. (2001) 'Communities of practice and organizational performance', *IBM Systems Journal* 40(4), http://www.research.ibm.com/journal/sj/404/lesser.html. last accessed: 18/2/06

[18] J. Nahapiet and S. Ghoshal, "Social Capital, Intellectual Capital and the Organizational Advantage," *Academy of Management Review* **23**, No. 2, 242–266 (1998), cited in Lesser & Storck (2001) ibid.

[19] Siemens, G. (2005), "Connectivism: Learning as Network-Creation", article, available from: http://www.elearnspace.org/Articles/networks.htm, last accessed: 18/2/06

[20] Lesser & Storck (2001) ibid.

[21] Lesser & Storck (2001) ibid.

[22] Nahapiet & Ghoshal (1998) ibid.

[23] Nahapiet & Ghoshal (1998) ibid.

[24] Nahapiet & Ghoshal (1998) ibid. p. 254

[25] Lesser & Storck (2001) ibid.

[26] Salmon, G. (2000) E-moderating: The Key to Teaching and Learning Online. London: Kogan Page

3.3 Cognitive Dimension

The cognitive dimension addresses the need for a shared context[27] or common language[28] through which to connect with people and ideas.

To an extent the National Strategies has already addressed the cognitive dimension – through the work already carried out over the past 5 years in creating a repository of materials and some shared understanding of those materials. However this has been a centrally driven and controlled process. Lesser & Storck suggest that this cognitive dimension of social capital can be developed through a shared repository into which anyone in the community can add materials using a common taxonomy to describe them.

---

[27] Lesser & Storck (2001) ibid.

[28] Nahapiet & Ghoshal (1998) ibid.

4 Using online systems to support communities of practice

Many commercial and open-source web-based products are being used to support communities of practice. Rather than attempt to analyse each tool in turn, this paper will look at the types of tools that are available and analyse their contribution to the development and maintenance of social capital within communities of practice.

4.1 Types of online tools

Instant Messaging

Instant messaging provides a means of individuals communicating with a specified set of people (a contacts list), either by text chat, by voice, or by videophone. The software, which is normally installed on each individual's computer, tells you when people in your contacts list are online and available.

Examples include: Skype, MSN Messenger, Jabber

Discussion forums

Discussion forums are web-based tools that allow the creation of closed or open groups in which people can start discussion "threads" and others can reply them. The messages may contain attachments and individual contributors may have a "profile" through which other people can find out about them and their history on the forum.

Examples include: phpBB, and most virtual learning environment (eg. Moodle, WebCT) and groupware systems (eg. Phpcollab, MS Sharepoint)

Email newsgroups

An email newsgroup is a centrally stored list of email addresses. Individuals can add their address to the newsgroup list. When an email is received by the newsgroup server it is automatically distributed to all subscribers.

Examples include: Google groups, Yahoo groups, listserv

Blogs

A blog is a web-based system where an individual can post text (and sometimes attachments, such as mp3 or image files) via a browser. This text is displayed in a dated format. Most blog systems allow some sort of categorizing or tagging of posts, and most publish an RSS feed (an XML file containing the blog post data) so that the posts can be distributed or syndicated to other websites and systems.

Examples include: Wordpress, b2evolution, Elgg, Blogger

Social networking

Social networking systems allow individuals to post information, or images, or links into a central repository. Each item can be tagged with one or more words. These tags are used to connect related items and therefore related individuals.

Examples include: Flikr, del.icio.us, furl, Elgg

4.2 Analysis of the tools

The following analysis looks at each of the tool-types in turn, and how they may be used to support each dimension of social capital, and thus develop and maintain communities of practice.

There will be overlaps between the tool-types, where a particular tool fits into more than one category. Whether this is seen as an advantage or disadvantage will depend greatly on the tool's interface. After the analysis, this paper looks at one particular tool and how it is being implemented to support the National Strategies framework rollout.

Tool-type	Structural Dimension	Relational Dimension	Cognitive Dimension
Instant messaging	Individuals have an online presence[29] The individual's immediate network is visualised through notifications of people coming online New members can be invited to join The network is based on existing relationships. Linking with unknown individuals from across the network is harder.	With the network based on existing relationships (which may be developed online elsewhere), there is very little explicit capability to build relationships within Instant Messaging systems. However, the presence-based technology potentially allows much faster interactions and responses, thus speeding the process of relationship building.	Instant messaging is an ephemeral medium in which there is no capacity for long term structuring or storage of information.
Discussion forums	Ongoing links to other individuals are not usually explicitly shown. Individuals may choose to receive postings by email in order to keep informed of activity in the forum.	Discussion forums often set the relationship norms and obligations through an FAQs posting which is kept near the top of the list of threads. Building a shared set of expectations comes through ongoing experience and practice in the community.	Information within discussion forums is structured in threads. Usually the only way to find information is to use the thread titles as a guide, or to use a search

[29] Eisenstadt, M. & Dzbor, M. (2002), "BuddySpace: Enhanced Presence Management for Collaborative Learning, Working, Gaming and Beyond", Submission to JabberConf Europe 2002, Knowledge Media Institute, The Open University (UK), available from: http://kmi.open.ac.uk/projects/buddyspace/docs/jabberconf02-eisenstadt-dzbor.pdf, last accessed: 18/2/06

[30] "How internet search engines work", How Stuff Works encyclopedia, http://computer.howstuffworks.com/search-engine1.htm, last accessed: 18/2/06

Tool-type	Structural Dimension	Relational Dimension	Cognitive Dimension
			engine which spiders[30]
Email newsgroup	Members of the newsgroup receive emails from the group – thus developing a sense of being part of a wider network. There is usually no way of connecting with individuals and their personal networks.	Email newsgroups, without a place to store messages/documents centrally, usually rely on experienced users to guide new users into the practices of the group. Some newsgroups have moderators who monitor and support, and occasionally block inappropriate messages.	If a newsgroup archives its emails on a website then it behaves in a similar way to a forum. If not, then the collective discussions may only be brought together inside each individual's email client. There is no central repository of information.

Tool-type	Structural Dimension	Relational Dimension	Cognitive Dimension
Blogs	Blogs are usually highly focussed around the individual. It is possible to write a blog with no sense of the network of readers. Most blogs allow some method of leaving comments or trackbacks[31] - which then can develop a sense of community. Many bloggers, however comment on each others' blogs from within their own – relying on services such as Google, Blogdigger and Technorati to make explicit the links between them. Bloggers usually then build up a "blogroll" of other bloggers that they read, often using tools such as Bloglines to aggregate these blogs.	Blogs enable learners to have a space in which to reflect on their learning[32], and, in so doing, become part of a reflective community.[33] Yet, to be part of a blogging community there still needs to be guidance/rules about the way relationships are carried out. This tends to happen through the examples provided by "senior" or more experienced bloggers within the community. There are blogging conventions which include the idea of linking to other people's postings. It is this that enables blogs to spread information rapidly.[34] There may also need to be public policies on what and what not to post – depending on the context of the blogging activity.[35]	The web-based nature of blogs means the information contained within them is readily accessible.[36] The tagging / categorisation systems allow tools such as Technorati to build up comprehensive pictures across a range of blogs (although it should be noted that folksonomy-style tagging has many perceived problems, due to its potential for idiosyncratic tags)[37]

[31] Wikipedia article: Trackback, available from: http://en.wikipedia.org/wiki/Trackback, last accessed: 18/2/06

[32] Williams, J.B. & Jacobs, A. (2004), | Exploring the use of blogs as learning spaces in the higher education sector", Australasian Journal of Educational Technology, 2004, 20(2), 232-247, available from: http://www.ascilite.org.au/ajet/ajet20/williams.html, last accessed: 18/2/06

[33] For example, the community of bloggers about education at: http://www.frappr.com/edubloggers

[34] For example, Scott Wilson's posting on the PLE (personal learning environment) debate, available from: http://www.cetis.ac.uk/members/scott/blogview?entry=20051126183704, last accessed: 18/2/06

[35] Li, C., Bernoff, J., McHarg, T. (2004) "Blogging: Bubble Or Big Deal? When And How Businesses Should Use Blogs", report from Forrester Research, available from: http://www.forrester.com/Research/Document/Excerpt/0,7211,35000,00.html, last accessed: 18/2/06

[36] Edmonds, K.A., Blustein, J.,Turnbull, J. (2004) "A Personal Information and Knowledge Infrastructure Integrator", Journal of Digital Information, Volume 5 Issue 1, Article No. 243, 2004-05-12, available from: http://jodi.ecs.soton.ac.uk/Articles/v05/i01/Edmonds/, last accessed: 18/2/06

[37] Golder, S. & Huberman, B.A. (2005), "The Structure of Collaborative Tagging Systems", Information Dynamics Lab, HP Labs, available from: http://arxiv.org/abs/cs.DL/0508082, last accessed: 18/2/06

Tool-type	Structural Dimension	Relational Dimension	Cognitive Dimension
Social networking	Social networking tools usually make the individual's place in the network very explicit – often suggesting where new connections may be made, by virtue of the tags or categories used by the individual.	In a social networking environment, as with the blogging environment, relational principles and norms tend to be picked up from those who are first in the community.	The information within a social networking tool becomes searchable and able to be analysed in a similar way to blog postings.

It can be seen, from the above analysis, that the technology, if chosen carefully, is able to support both the structural and cognitive dimensions of building social capital. However the relational dimension usually needs to be supported and developed by people demonstrating how the community will work.

5 Building a National Strategies Community of Practice

The author would recommend that the National Strategies support the rollout of the revised frameworks by developing an open community of practice which takes advantage of the properties of networks to rapidly propagate information and embed good practice in schools.

This community could be based around an open-source blogging and social networking platform known as Elgg[38] [39]. This platform allows individuals to do the following (analysed in terms of social capital):

Structural Dimension	Relational Dimension	Cognitive Dimension
Attach tags to describe each blog posting or file Build an online profile Link with other people through related tags or elements in their profiles Publish RSS feeds of blog postings or files Aggregate RSS feeds in a personal resource centre Create organic communities within the platform Collect a list of "friends" in a personal network Invite friends to join the community	Decide the level of access to each blog posting, file or profile element	Easily post to a personal blog Store files in a personal area

The technology, then, creates part of the structural and cognitive dimensions. However there would still be work to be done, away from the technology, to enable this community to develop its social capital, as shown in the following table:

[38] Tosh, D., Werdmuller, B. (2004) "Creation of a learning landscape: weblogging and social networking in the context of e-portfolios", draft paper, available from: http://eradc.org/papers/Learning_landscape.pdf, last accessed: 18/2/06

[39] Elgg – a Learning Landscape: http://elgg.org/, last accessed: 18/2/06

Structural Dimension	Relational Dimension	Cognitive Dimension
The initial network would need to be pump-primed, to enable links to be made between the key people who are likely to be the hubs of the community.	The norms and conventions would need to be addressed with these key people, who are new to blogs. The expectations of the individuals concerned would need to be explored – to answer the questions "What's in it for me?" and "What's in it for them?" – without motivation to contribute any community of practice is likely to fail. Examples of what and how to write in blog posts in this context may be needed.	A discussion around the uses, advantages and disadvantages of the tagging system would be required, with examples on how groups might decide to tag materials.

This initial start-up session could take the form of a workshop with a number of Local Authority consultants and regional advisors who would be encouraged to use the blogs for themselves, but then invite teachers in their areas to join the community and begin to learn from each other. The expectation being that the community will grow its social capital organically as links are made across the regions.

It would be hoped that this community of practice might support the development of "professional learners"[40] in the teaching community, and that, by "talking about their learning", "good teachers [will] become better teachers.[41]

[40] Eraut, M. (1994) "Developing Professional Knowledge and Competence", London: Falmer Press, cited in Harland, J. & Kinder, K. (1997) ibid

[41] Stoll, L., Fink, D. (1996), "Changing our schools", Open University Press, Milton Keynes, cited in "Learning Conversations", a pamphlet from General Teaching Council for England, available from: http://www.gtce.org.uk/shared/contentlibs/126802/CPD/126322/Learning_Conversation.pdf, last accessed: 18/2/06

6 Bibliography

Barabasi, A.-L. (2002). "Linked: The New Science of Networks", Cambridge, Mass.: Perseus Pub.

Burden, K., Cascade ICT training web page, http://www.hull.ac.uk/ces/people/KevinBurden.html, last accessed: 14/2/06

DfES, "Reviewing the Frameworks for teaching literacy and mathematics", DfES, http://www.standards.dfes.gov.uk/primary/publications/literacy/1200695/, last accessed: 10/2/06

Edmonds, K.A., Blustein, J.,Turnbull, J. (2004) "A Personal Information and Knowledge Infrastructure Integrator", Journal of Digital Information, Volume 5 Issue 1, Article No. 243, 2004-05-12, available from: http://jodi.ecs.soton.ac.uk/Articles/v05/i01/Edmonds/, last accessed: 18/2/06

Eisenstadt, M. & Dzbor, M. (2002), "BuddySpace: Enhanced Presence Management for Collaborative Learning, Working, Gaming and Beyond", Submission to JabberConf Europe 2002, Knowledge Media Institute, The Open University (UK), available from: http://kmi.open.ac.uk/projects/buddyspace/docs/jabberconf02-eisenstadt-dzbor.pdf, last accessed: 18/2/06

Eraut, M. (1994) "Developing Professional Knowledge and Competence", London: Falmer Press, cited in Harland, J. & Kinder, K. (1997) ibid

Eraut, M. (1995) "Inservice Education", International Encyclopedia of Teaching and Teacher Education, 2nd edition, Anderson L.W. (ed), Pergamon, Columbia, cited in Mathekga, A.M. (2005) "The impact of in-service training: A reassessment of the cascade model", MPhil thesis, University of Pretoria

Evans, K. (1990), "Preparing for the 'new INSET': External agency intervention in the management of in-service training and staff development", Research in Education Management and Policy: Retrospect and Prospect, Saran R. and Trafford V (ed), The Flamer Press, New York, cited in Mathekga, A.M. (2005) "The impact of in-service training: A reassessment of the cascade model", MPhil thesis, University of Pretoria

Golder, S. & Huberman, B.A. (2005), "The Structure of Collaborative Tagging Systems", Information Dynamics Lab, HP Labs, available from: http://arxiv.org/abs/cs.DL/0508082, last accessed: 18/2/06

Harland, J. & Kinder, K. (1997) "Teachers' Continuing Professional Development: framing a model of outcomes", British Journal of In-service Education, Vol. 23, No. 1, 1997, pub. Routledge. Available from: http://taylorandfrancis.metapress.com/openurl.asp?genre=article&issn=1367-4587&volume=23&issue=1&spage=71, last accessed: 15/2/06

Hayes, D. (2000), "Cascade and training teacher's professional development", English Language Journal; vol. 54 (2); 135-145, cited in Mathekga, A.M. (2005) "The impact of in-service training: A reassessment of the cascade model", MPhil thesis, University of Pretoria

J. Nahapiet and S. Ghoshal, "Social Capital, Intellectual Capital and the Organizational Advantage," *Academy of Management Review* **23**, No. 2, 242–266 (1998), cited in Lesser & Storck (2001) ibid.

Lesser, E. L. and Storck, J. (2001) 'Communities of practice and organizational performance', *IBM Systems Journal* 40(4), http://www.research.ibm.com/journal/sj/404/lesser.html. last accessed: 18/2/06

Li, C., Bernoff, J., McHarg, T. (2004) "Blogging: Bubble Or Big Deal? When And How Businesses Should Use Blogs", report from Forrester Research, available from: http://www.forrester.com/Research/Document/Excerpt/0,7211,35000,00.html, last accessed: 18/2/06

Mathematics Assessment Resource Service, Professional Development Support, http://www.nottingham.ac.uk/education/MARS/services/pd.htm, last accessed: 14/2/06

Salmon, G. (2000) E-moderating: The Key to Teaching and Learning Online. London: Kogan Page

Siemens, G. (2005), "Connectivism: Learning as Network-Creation", article, available from: http://www.elearnspace.org/Articles/networks.htm, last accessed: 18/2/06

Stoll, L., Fink, D. (1996), “Changing our schools”, Open University Press, Milton Keynes, cited in “Learning Conversations”, a pamphlet from General Teaching Council for England, available from: http://www.gtce.org.uk/shared/contentlibs/126802/CPD/126322/Learning_Conversation.pdf, last accessed: 18/2/06

Tosh, D., Werdmuller, B. (2004) “Creation of a learning landscape: weblogging and social networking in the context of e-portfolios”, draft paper, available from: http://eradc.org/papers/Learning_landscape.pdf, last accessed: 18/2/06

Unknown author, “How internet search engines work”, How Stuff Works encyclopedia, http://computer.howstuffworks.com/search-engine1.htm, last accessed: 18/2/06

Unknown author, “Teaching and Learning Models and Approaches”, http://www.bbk.ac.uk/ccs/elearn/teach_and_learn_models.htm#cascade, last accessed: 14/2/06

Wenger, E. (1998), “Communities of Practice: learning as a social system”, Systems Thinker, vol 9, issue 5, Pegasus Communications, available from: http://www.co-i-l.com/coil/knowledge-garden/cop/lss.shtml, last accessed: 18/2/06

Wikipedia article: Trackback, available from: http://en.wikipedia.org/wiki/Trackback, last accessed: 18/2/06

Williams, J.B. & Jacobs, A. (2004), | Exploring the use of blogs as learning spaces in the higher education sector”, Australasian Journal of Educational Technology, 2004, 20(2), 232-247, available from: http://www.ascilite.org.au/ajet/ajet20/williams.html, last accessed: 18/2/06