

# **Can e-Learning based on Computer-Mediated Communication Improve Distance Education?**

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# Can e-Learning based on Computer-Mediated Communication Improve Distance Education?

## Executive Summary

This article sets out to review the arguments for using Computer-Mediated Communication (CMC) based e-learning in third-level distance education. The arguments are reviewed under three headings: (1) economic; (2) structural and (3) pedagogic.

When compared to 'second generation'<sup>1</sup> distance teaching, the economic arguments for using CMC-based e-learning are not strong.

The structural arguments, according to Kaye, relate to "the technological characteristics of the CMC medium and the ways they match the nature of the distance education environment" (Kaye 1989, pg 11). However, if one asks what one can *do* with CMC because of its structural characteristics, then it becomes clear that CMC is one tool among many that can be used to reach particular objectives. The particular objective of reducing student drop-out rate, which is an important one in distance education, is explored and a potential role for CMC in addressing this objective is investigated.

The arguments that CMC can improve the pedagogical quality of distance education are the crucial arguments and therefore receive the most attention. Some frequently-made claims that online learning can improve pedagogy are discussed and critically reviewed. This will be followed by looking at some practical problems that have emerged when CMC has been used in a distance education context. One obvious improvement in pedagogy would be the enhanced teaching and learning of higher order cognitive skills, such as critical thinking and deep understanding. Therefore, what exactly happens when students engage in higher order learning is discussed and it emerges that there is a strong correlation between what some learning theorists have to say on this subject and what practitioners in online learning say happens in the productive use of CMC in education. However, in order to promote the productive use of CMC, tutors need to acquire online moderation skills and use specific pedagogical techniques. These are reviewed and one particular pedagogical technique, which carries the potential to promote higher order learning and address some of the practical difficulties that arise in the use of CMC, is detailed. Finally, there is a short discussion of the type of educational programme that may be particularly suited to delivery via CMC.

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<sup>1</sup> Nipper defined second generation distance education as a teaching system which integrated "the use of print with broadcast media, cassettes and – to some extent – computers. Feedback processes include ... telephone counselling and some face-to-face tutorials" (Nipper 1989, pg 63). Second generation distance teaching is usually associated with the teaching methods developed by the open and distance teaching universities which emerged in the late 1960s and 1970s.

## 1.0 Introduction

A large number of claims have been made that Computer-Mediated Communication (CMC)<sup>2</sup> based e-learning has the potential to radically transform not just distance education but education in general. The following quotes will give a flavour of the claims being made: “Network technologies provide the means whereby learners can interact with peers, resources, and experts to build knowledge and develop skills.”; “network learning systems aim to give learners increased control and agency in the knowledge-building process”; “Restrictions of time are dissolved by networks.” “network learning helps to dissolve the dichotomy between theory and practice”; “Network learning is a framework for lifelong learning.”; “Computer-mediated communication [CMC] is capable of supporting socio- emotional communication as well as task-oriented communication.” (All quotes are from Harasim et al 1995, pgs 272-277). With regards to the use of this technology on the two main delivery modes of third level education, Kaye makes the point that CMC is seen by:

"colleagues in distance teaching institutions as a way of returning to a more intimate and co-operative form of group-based learning ... and by colleagues in traditional universities as a way of extending the resources of the classroom to those unable to get to the campus" (Kaye 1989, pg 9)<sup>3</sup>.

The aim of this article is to review these and other claims made for use of e-learning in tertiary education with particular reference to the specific context of their potential for distance education. The context of distance education is a particularly useful when discussing e-learning because (a) since its inception, distance education has used a variety of technologies to deliver its courses and therefore the new technologies underlying e-learning can be compared with the older technologies and (b) as conventional higher education adopts e-learning, it begins to develop some of the attributes which have traditionally being associated with distance education (such as physical separation of teacher and learner, greater flexibility for the learner as to time and place of study, etc.) - distance education has had extended experience of dealing with the problems that can arise from these attributes.

The structure of the article will broadly follow Kaye’s arguments for the use of CMC in distance education (Kaye 1989 pgs 10-13), he grouped his arguments under the following three headings:

- Economic
- Structural
- Pedagogical.

In Section 3, the economic arguments for the use of networked learning will be reviewed. As will be seen, in the context of second generation distance teaching, the economic arguments for using CMC are not strong. It therefore falls mainly to the other two groups of arguments to provide a rationale for the use of CMC in distance education.

The structural arguments put forward by Kaye revolve around the match between the technological characteristics of the CMC medium and the needs of distance education students (i.e. freedom from time and space constraints, etc.). In Section 4, these arguments will be reviewed. Particular emphasis will be placed on the potential of online student support to

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<sup>2</sup> In Section 2.0, an explanation is given of the terminology used in this article. In this section, it should be sufficient to know that the terms e-learning and online learning are being used synonymously and that computer-mediated communication (CMC) is the use of computer networks for communication between individuals or within groups.

<sup>3</sup> For an extended discussion on the possible convergence of distance and on-campus universities, with particular reference to the role of technology, see Curran 1997.

improve the quality of the overall educational experience of distance education students, with particular reference to its potential to help reduce the level of student drop-out. A possible programme aimed at reducing drop-out, largely based in the use of CMC, will be detailed.

Section 5 will review the arguments for the potential of CMC to improve the pedagogy of distance education programmes. In many ways, these are the crucial arguments and they will therefore receive the most sustained discussion. The review will start (Section 5.1) by looking at some criticisms of current pedagogy and the proposals made by two relatively new learning theories (constructivism and situated learning theories) to overcome these criticisms and thus improve pedagogy. In the next section (Section 5.2), the claims of practitioners that online learning can improve pedagogy will be discussed and critically reviewed. This will be followed (Section 5.3) by looking at some of the practical problems that have emerged when CMC has been used in a distance education context. One obvious improvement in pedagogy would be the enhanced teaching and learning of higher order cognitive skills, such as critical thinking and deep understanding. Therefore, the next section (Section 5.4) will start by reviewing what exactly happens when students engage in higher order learning. In this discussion, we will find that there is a strong correlation between what learning theorists have to say on this subject and what practitioners in online learning say what happens in the productive use of CMC in education. In the next section (Section 5.5), there will be a review of the online moderating skills needed to foster higher order learning. This will be placed in the context of a stage theory of moderating skills and the section will end with the details of how a particular pedagogical strategy could be implemented in CMC which aims to promote higher order learning and also deal with some of the practical difficulties which arise in the use of CMC. Finally, in Section 6, there is a short discussion of the type of educational programme which may be particularly suited to delivery via CMC.

Before going on to discuss these issues, it might be useful to define some of the terms used.

## 2.0 Terminology

As the terminology used by various writers in this area seems to have different meanings, I would therefore like to clarify the meaning given to various terms in this article.

The information and communication technologies (ICTs) used in e-learning are frequently described as synchronous or asynchronous. Synchronous technologies are those which require the individuals communicating to be using the technology at the same time. These include telephone, audio-conferencing, online-chat, video conferencing and audiographics.

Asynchronous technologies allow for a period of time to elapse between message and response. They include telephone answering machines, e-mail, bulletin boards and computer conferencing. Online Resources are another group of technologies used in e-learning. These include databases, online catalogues, file-transfer, Web-resources, web-based training, simulations and online fulltext articles. They are usually accessed by the user on his or her own.

The term Computer Mediated Communication (CMC) could technically include where computers and computer networks are used for both synchronous and asynchronous communication with another person or persons. However, following Kaye, the term CMC (unless otherwise explicitly stated) will be used in this article to apply to asynchronous computer-based communication technologies only i.e. essentially e-mail and computer conferencing (See Kaye 1989, pg 6).

The terms online learning and e-learning will be used synonymously to cover the use of CMC (synchronous and asynchronous) and/or Online Resources in the context of teaching and learning. Thompson defines e-learning as "instructional content or learning experiences delivered or enabled by electronic technology" (Thompson 2001, pg 8). The terms online education and e-education will be used when e-learning takes place in the context of an educational institution on an accredited programme.

The term networked learning is often used as synonymous with online learning. However, networked learning also frequently has the connotations of a community of learners (and tutors) engaged online in learning activities (such as having discussions or collaborating). Jones and Steeples provide the following definition of networked learning:

Networked learning is learning in which information and communication technology (C&IT) is used to promote connections: between one learner and other learners, between learners and tutors, between a learning community and its resources. (Jones and Steeples 2001, pg 2)

A term similar to networked learning is tele-learning as defined by Collis: "making connections among persons and resources through communication technologies for learning related purposes" (Collis 1996, pg 9)<sup>4</sup>.

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<sup>4</sup> One difference is that Collis would include the 'older' broadcast media of radio and television in communication technologies.

### 3.0 Costs of CMC-based Teaching in Distance Education

With rare exceptions, even the proponents of CMC-based online learning in distance education do not claim that its implementation will lead to cost savings. As far back as 1989, Kaye stated that “If one takes a successful, multi-media, distance teaching institution ... as a starting point for comparison, the purely economic argument for CMC is far [from] convincing” (Kaye 1989, pg13). Some argued that cost would decrease over time but in 1997, Romiszowski and Ravitz stated “There is growing acceptance of the notion that CMC is not a route to major cost-cutting,” (Romiszowski and Ravitz 1997, pg 762) and as recently as 2001, when reviewing the implementation of online learning by the University of South Australia, King and his colleagues, discussing the early emphasis placed on cost-effectiveness, state that “This is not to say that the University believes that moving to online teaching and learning will lead to cost savings” (King et al 2001, pg 9).

The reasons are not hard to find. In a 1993 study, Bacsich and his colleagues developed a number of scenarios for the purposes of comparing the costs of delivering the tutoring element of a course using standard second generation distance teaching methods and using computer conferencing. The scenarios included varying levels of student enrolment with different underlying support infrastructures. Under the assumptions made in the study<sup>5</sup>, even when student costs were removed (i.e. the costs to the student of providing the computer, modem, paying online charges, etc.), the cost of providing the course via computer conferencing was always more expensive. “The reason is that the provider costs are made up of several components while tutor payments will be identical for computer conferencing and conventional tutorials, the cost of delivering computer conferencing does not arise in conventional tutoring, hence computer conferencing will inevitably be more expensive from the providers point of view” (Bacsich et al 1993, pg21).

There are some reports of the use of CMC being cost-effective. For example, Phelps and her colleagues looked at the use of CMC for two training courses at a distance and compared it with running the same courses face-to-face. They found that while, on the initial presentation of the courses, the costs were similar, “when the costs of conversion and execution are amortized, CMC costs 43% less after five iterations [i.e. presentations]. After ten iterations, CMC would save 48%.” (Phelps et al 1991, pgs 13-14). However, this study was carried out in a training context (US Army Reserve) where the face-to-face participants were paid for their time and expenses. In a distance education context, it is not even standard that tutors get paid for the costs they incur for travelling to give tutorials at study centres. However, the example does remind us that, in all studies of cost-effectiveness, context is all important.

The underlying context when comparing the cost of online education with second generation distance education is that second generation distance education is itself usually very cost effective as compared to conventional face-to-face university teaching as a number of empirical studies have shown (see, for example, Wagner 1972, Wagner 1977, Kim 1985, Muta 1984, Muta and Sakamoto, 1989). This cost-effectiveness is based on a number of factors including (a) economies of scale associated with relatively high student enrolment which offset the initial costs of the production of the course materials; (b) a large reduction in the requirement for campus accommodation and (c) use of part-time staff for tutoring.

However, the provision of tutorial support (which is the element of course delivery which CMC has the most to offer) is not subject to economies of scale i.e. the cost of tutorial support rises in

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<sup>5</sup> Two of the key assumptions were that (1) tutors would get paid for the same number of hours teaching on-line as they get paid for face-to-face teaching and (2) the fees charged to students for both online and standard distance education delivery would be the same.

proportion to the number of students whether it is conventional face-to-face tutorials or CMC based tutorials. Webb gives a salutary case study where he discussed the online provision of a distance education programme in Information Technology [IT] that included substantial online tutorial support "An investigation of costs and benefits of running the IT program revealed that its operating costs were twice that of running an equivalent program using traditional distance teaching methods. ... The sad conclusion was that the 'better' pedagogy should be dropped for pragmatic reasons." (Webb 2000, pg 3)<sup>6</sup>. Webb goes on to conclude "Most of the examples we see of online delivery today are the results of enthusiastic individuals. An examination of the true costs of these new exciting programs is likely to reveal that their methodologies are unsustainable on a broad institution-wide approach." (Webb 2000, pg 4). One well-known researcher in the field of economics of distance teaching has stated that "The biggest and I suggest least costed ingredient in the costs of online learning is the cost of supporting learners online ... it is these costs that may in the end constrain the extent to which large scale distance teaching universities adopt online technologies" (Rumble 1999, pg4<sup>7</sup>).

If CMC-based online education is not as cost effective as conventional distance education, the question arises as to why would one want to implement CMC-based teaching in distance education? Possible reasons are discussed in the next two sections.

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<sup>6</sup> Whether the pedagogy is 'better' is discussed in Section 5 below.

<sup>7</sup> Rumble's suggestion could be rephrased to read: it is these costs that may in the end constrain the extent to which distance teaching universities adopt online technologies on a large scale.

#### 4.0 Online Education and the Quality of Service

The structural arguments, according to Kaye, relate to "the technological characteristics of the CMC medium and the ways they match the nature of the distance education environment" (Kaye 1989, pg 11). Kaye structural arguments include:

- students can potentially contact their tutor and fellow students at any time from any place (which has the appropriate computer connections)
- a greater range of experts or 'guest lectures' can be brought online
- assignment 'turnround' can be improved and thus students can get quicker feedback on their work

CMC can allow students to contact their tutors at any time. However, currently most distance teaching systems allow for tutor-student contact via telephone. Also, as we have seen in Section 3, CMC between tutors and students has a cost and this cost increases as the desired response time to student queries increases. A greater range of experts can be brought online at less cost than face-to-face but still at a cost and this cost increases with the level of interaction one wishes the students and experts to have. The return of assignments to students can be speeded up by the use of online communication. However, those with experience in this area say that the major proportion of the delays in this area are caused by the time it takes tutor to process the assignments rather than the time taken for conveyance.

What is clear about these structural reasons for using CMC is that they are primarily about improving the quality of service to distance education students<sup>8</sup>. The quality of service to students on distance education programmes could be enhanced by a variety of means. For example, extra tutorials could be provided, more learning resources (online or hard copy) could be provided, more individualised telephone support could be provided, etc. The question arises: Why would one use CMC rather than the other means? What are the criteria one would use to decide on the effectiveness of one service enhancement over another?

In addition, in common with most third-level institutions, distance teaching universities are facing increased student numbers with a decreasing support per student coming from the public purse - what Bates has called the need to do more with less (Bates 2000, pg 8). Therefore, to give a context for the ensuing discussion, I will like to make the 'hard-line' assumption that no extra funding is available to improve quality of service. The question then arises: is there anything that can be done which improves quality of service but not increase cost? One obvious answer is, if measures can be taken that reduce the drop-out rate then, because each student who drops out represents a loss of income in future years, the extent to which drop-out is reduced could represent income that could be used to improve quality of service<sup>9</sup>.

#### 4.1 Drop-Out Rates in Distance Education

Before progressing to look at the appropriate means to adopt aimed at reducing drop-out, it may be useful to digress slightly to look at drop-out rates in distance education. As Kember has noted "institutions are usually extremely coy about publicizing their drop-out rates" (Kember 1995, pg

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<sup>8</sup> Some of the structural reasons do not concern improvement to service. For example, one of the other structural reasons given by Kaye is that CMC allows for students to be resident abroad. This would be an important factor for the (relatively few?) programmes which could attract substantial numbers of overseas students.

<sup>9</sup> In a number of distance education systems, students' fees cover variable cost with a small residual per course/module which accrues to central funds. If drop-out can be reduced, an income stream will be generated for central funds in the succeeding years.

23). A possible consequence of this reticence is that the issue of drop-out rates have not got the attention they deserve.

Kember goes on to point out that “Even where data is available it may be of limited value, because of the variety of ways in which students can fail to complete courses and the alternative definitions and measuring procedures used by institutions.” (Kember 1995, pg 23). With this proviso in mind, it is still interesting to review the published figures on drop-out rates. Quoting various sources, Kember gives some very high drop-out rates. For example, the Sukhothai Thammathirat Open University in Thailand is quoted as having a drop-out rate of 62% after two years; Costa Rica’s open university is quoted as having a drop-out rate of 76% by the end of the fifth semester; the distance education university in Venezuela is said to have an overall drop-out rate of 79% and the Athabasca University in Canada is reported to have an overall drop-out rate of 71% (although this decreases to 42% if non-starters are excluded) (Kember 1995, pg24). Perraton (quoting a 1980 study by Wagner) reports that the UK Open University has an overall drop-out rate of 46% of finally registered students<sup>10</sup> (Perraton 1982, pg 30).

How do they compare with the drop-out rates in conventional face-to-face third level institutions? Lynch and her colleagues report that “European rates [of first year departure from colleges and universities] show wide variations ...: the estimates for the UK are between 6 and 13 percent; 23% in Denmark; 29-31% in Germany; 25-30% in France and 64% in Italy” (Lynch et al 1999, pg 2). Therefore, drop-out in conventional programmes can be as high as in distance education programmes. Nevertheless, it probably the case that drop-out rates are, on average, higher in distance education programmes than similar conventionally delivered programmes.

It should also be noted that there are different drop-out rates in different disciplines. For example, at the UK Open University, the drop-out rate between initial enrolment and examination enrolment for the Arts faculty in 1971 was 29%, the equivalent figures and the Science/Technology and Mathematics faculties were 42% and 50% respectively (Lumsden and Ritchie 1975, pg 246).

Particularly noteworthy is the drop-out at the beginning of courses. As noted above, there are high drop-out rates between initial and final registration at the UK Open University and, more generally, a significant proportion of those students who drop-out do not submit even one assignment. As Kember notes “Within a course, attrition is usually higher, and often much higher, in the early stages” (Kember 1995, pg 24). In OSCAIL (Ireland’s National Distance Education Centre), these early drop-out students are concentrated in particular Level 1<sup>11</sup> modules on its undergraduate programmes. In its BSc in Information Technology, the particular modules with high early drop-out are Management Science 1 (which is a standard first year science mathematics course) and Communications Technology 1 (a first year science physics course.) In its BA in Humanities the module with the highest drop-out is Psychology 1 (which is a standard

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<sup>10</sup> In other words, of those students who undergo final registration, 54% graduate (Perraton 1982, pg 30). Final registration is the point by which students have to pay their fees. The drop-out rate from initial to final registration is substantial. Lumsden and Ritchie report that it was 24% in 1972 (Lumsden and Ritchie 1975, pg 246) and Kember reports that it was 28% in 1982 (Kember 1995, pg 24). Lumsden and Ritchie do point out that “students, by not having to pay tuition fees until the end of April, were implicitly given three months to decide whether or not to continue with course(s) for which they had initially registered” (Lumsden and Ritchie 1975, pg 246). Therefore, measuring drop-out rate as the percentage of finally registered students would give, on balance, a more accurate figure.

<sup>11</sup> Level 1 modules are the first credit modules that students undertake when they start on an OSCAIL undergraduate programme. Students must successfully complete Level 1 modules in a subject before they can enroll for Level 2 and 3 modules.

Introduction to Psychology course). The potential uses of CMC in helping to reduce student drop-out (and early drop-out, in particular) will be addressed in Section 4.3. However, before doing so, I think it is useful to quickly review Kember's theory of student persistence.

#### **4.2 Kember's Theory of Persistence in Distance Education**

Kember developed a two-track loop model of student persistence in distance education programmes which includes variables grouped under the following headings: student entry characteristics; social integration; external attribution; academic integration and academic incompatibility (Kember 1995, pg64). To (greatly) simplify Kember's model, students come to distance education with certain entry characteristics (educational level, employment, family status, etc.) which lean them towards either to enter a positive track of social and academic integration or a negative track of external attribution and academic incompatibility. It is the interaction of these elements which lead each individual student to make a decision to persist or to drop-out. In addition, this is not a once-off decision but "looped" in that student revisits the decisions with changing circumstances. Kember goes on to derive a number of implications and recommendations based on his model. These are in the areas of instructional design, tutorial support and student counselling. While a number of his recommendations are relevant to this report, I would like to focus on his recommendations regarding collective affiliation, study skills and social integration.

"Collective affiliation means ... that students feel that they are an integral part of the college." (Kember 1995, pg 184). Kember claims that if students have a sense of belonging then this is positively correlated with persistence. He details the ways different channels of communication (mail, telephone, face-to-face) which can be used to enhance collective affiliation but, interestingly, does not mention the use of CMC.

Having good study skills is also positively correlated with persistence<sup>12</sup>. However, he identifies the problems which exist with the traditional approach of teaching study skills as a separate course (see Greeno et al 1996, pg35). In particular, the problem that the new skills do not transfer to the learning situation. He goes on to recommend that study skills be integrated into course materials, at least at introductory level, supplemented by a limited number of group discussions.

Social integration has a number of facets (such as students fitting study demands into schedules of work and family commitments). One facet I would like to draw attention to is that, because of the open entry policies (which are standard in a large number of distance teaching universities), students on distance education courses "might have had little or no [previous] contact with an academic environment so be unused to the expectations and the, often implicit, conventions of academe." (Kember 1995, pg 202).

It will be obvious that Kember's ideas of collective affiliation and social integration are closely allied to what Brown and his colleagues called learning as a process of enculturation. "Given the chance to observe and practice *in situ* the behavior of members of a culture, people pick up relevant jargon, imitate behavior, and gradually start to act in accordance with its norms." (Brown et al 1989, pg 34).

#### **4.3 CMC and Reducing Student Drop-out**

The direction of the argument being pursued will hopefully be obvious at this point, but let me state it explicitly: I believe that there is a potentially significant role for CMC in helping to reduce drop-out in distance education programmes.

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<sup>12</sup> Kember identifies good study skills as those which promote deep learning. (See Kember 1995, pg 196)

What are the ways in which CMC could be used to help reduce drop-out? There is obviously a wide variety of ways - I will detail below five different methods. They are not meant to be exhaustive, rather the idea is to articulate a reasonably integrated set of services (with CMC at their core) aimed at reducing drop-out. They are influenced by Kember's recommendations. The five methods are:

- (1) Helpline: As Goodyear says "In the helpline approach the tutor fields questions and problems posed by individual learners and aims to provide a response tailored to the specific needs of the learner. If the tutor thinks the issue is likely to be of general interest, he or she may post it in a suitably anonymized form, in a place where other members of the group can read it." (Goodyear 1995/1996, pg 79).
- (2) Allied to Helpline, an online tutor would direct students to online resources – these could range from previous answers to helpline questions to relevant websites to online fulltext journals. A focus could be on helping to improve the students' own information retrieval skills.
- (3) Along with these skills, an online tutor could also promote more general study skills especially if these were integrated into the course material.
- (4) Fitting naturally with study skills, an online tutor could provide guidance to the norms of the discipline. These could range from simple informational items (such as forms of referencing) to much more general advice (such as advising on the norms of discourse within the relevant discipline).
- (5) An online tutor could promote the use of online peer support groups. Many distance teaching organisations circulate the names of students and addresses on its programmes to other students (or, to be more accurate, circulate the names and addresses of those who consent to have this information circulated). However, as Kember points out, "Merely issuing students with a list of other students' addresses, as commonly happens, usually seems to achieve very little." (Kember 1995, pg 192). An online tutor could create online spaces for groups of students who wish to work together and provide guidance on how best to work online. Goodyear reports that online peer support groups were used mainly for social communication and that they were valued by students as a source of moral support and for reducing the sense of isolation which is endemic to distance education. (Goodyear 1995/1996, pg 88).

It will be obvious that to provide all students with the type of online support services outlined above would be extremely costly – the cost of providing the helpline service alone, with any reasonable response time, could prove to be prohibitively expensive. Such services could be confined to first year students or even restricted to those courses/modules that are known to have large drop-out rates (See Section 4.2 above). In fact, an interesting experiment could be conducted, whereby services such as outlined above could be provided for a cohort of students in one or two of the 'large drop-out' modules and its effect on student persistence could be evaluated for comparison with drop-out rates in previous years.

## **5.0 CMC and Improving Pedagogy**

The third set of arguments for introducing CMC in distance education is to improve the pedagogical effectiveness of distance education programmes. However, the phrase “to improve the pedagogical effectiveness” covers a very wide area. I therefore propose to proceed as follows: To start, some problems with current pedagogy will be reviewed and also two of the main learning theories that aim to overcome these problems (Section 5.1). In the next section (Section 5.2), the claims of practitioners that online learning can improve pedagogy will be discussed and critically reviewed. This will be followed (in Section 5.3) by a review of some of the practical problems that have emerged when CMC has been used in a distance education context. One obvious improvement in pedagogy would be the enhanced teaching and learning of higher order cognitive skills, such as critical thinking and deep understanding. Therefore, the next section (Section 5.4) will start by reviewing what exactly happens when students engage in higher order learning. In this discussion, we will find that there is a strong correlation between what learning theorists have to say on this subject and what practitioners in online learning say what happens in the productive use of CMC in education. In the final section (Section 5.5), there will be a review of the online moderating skills needed to foster higher order learning. This will be placed in the context of a stage theory of moderating skills and the section will end with the details of how a particular pedagogical strategy could be implemented in CMC which aims to promote higher order learning while also dealing with some of the practical difficulties which arise in the use of CMC.

### **5.1 Criticisms of Current Distance Education Pedagogy**

Criticisms of current pedagogical practices within, what is referred to above as, second generation distance teaching can be quite trenchant. In the following subsection (Section 5.1.1), criticism coming from constructivist learning theorists will be reviewed. In the next subsection (5.1.2), I will review criticism coming from the situated learning theorists. In both cases, what the theorists suggest should be done to overcome the criticisms will be briefly discussed.

#### **5.1.1 Criticisms from the Constructivists**

In a paper on the relevance of constructivism and CMC to distance education, Jonassen and his colleagues describe the traditional teaching and learning as a transmissive model where “The learner’s role is to remember and reproduce the knowledge that is transmitted by the teacher or professor.” (Jonassen et al 1995, pg 11). They go on to describe the transmissive model (somewhat pejoratively) as the “sponge method”. “In the sponge method, the teacher imparts knowledge to the learners, who absorb it. During the assessment phase, the knowledge that the learners should have acquired from the teacher is ‘wrung out’ of them. The quality of learning is considered a function of how well the student can reproduce the thinking of the instructor.” (Jonassen et al, 1995 pg 11).

As a corrective to the transmissive approach, Jonassen and his colleagues propose a constructivist approach. They start with the oft-quoted statement on constructivist epistemology “Constructivists believe that our personal world is constructed in our minds and that personal constructions define our personal realities.” (Jonassen et al 1995, pg11) and go on to discuss its implications for learning and instruction. However, they start by acknowledging that “Constructivist instruction is an oxymoron” (Jonassen et al 1995, pg 11) and, instead of giving a systematic instructional design, lay down four principles under which constructivist learning environments may be built and ‘meaning making’ fostered. These four principles are context, construction, collaboration and conversation. They then review how different computer based technologies (Computer Mediated Communication, Distributed Software Environments and Computer Supported Collaborative Work) can offer distance education alternative approaches to

facilitating constructivist learning. They conclude by saying that “Constructivism can provide a theoretical basis for unique and exciting distance learning environments. These environments should emerge from authentic tasks, engage the learners in meaningful, problem based thinking, and require negotiation of meaning and reflection on what has been learnt.” (Jonassen et al 1995, pg 21)<sup>13</sup>.

Constructivism has been criticised on a number of fronts. Constructivist epistemology has been criticised for leaning towards idealism. As Stone and Goodyear argue “constructivism exaggerates the extent to which (and misrepresents the *way* in which) knowledge is a personal construction” (Stone and Goodyear 1995, pg 6, italics in original). They point out that “the real world places constraints on what are adequate ways of conceptualising the world and adequate claims about it.” (Stone and Goodyear 1995, pg 6).

The oxymoron of constructivist instructional design has also been criticised. Pushing constructivist arguments to their logical limit, Braden states that “Logically, if determining the meaning of things is delayed until the moment of learning [by the learners], designers cannot determine in advance the nature of content.” (Braden 1996, pg 17). In a number of descriptions of constructivist learning environments, there would seem to be, what I would call, a ‘splatter-gun’ approach – one where the learner is placed in a learning environment of learning resources, relevant problems and an exhortation towards collaboration with the belief that learning will occur. One well-known instructional designer Water Dick (from the traditional ‘objectivist’ school of instructional design) put this another way “if instructional designers design instruction, then constructivists are constructing something else. This ‘something else’ may be desirable education, but it does not appear to be instruction.” (Dick 1992, pg 97)<sup>14</sup>. When constructivists (or at least those claiming to be constructivist) take a more directive instructional approach, then their instructional design begins to resemble more ‘objectivist’ approaches. On reviewing these (and other) criticisms of constructivism, Stone and Goodyear conclude “We suggest that the need to respect and indeed facilitate learners’ processes of possibly idiosyncratic meaning making if anything strengthens our social obligation, as professional instructors or instructional designers, to design appropriate sequences and structures of learning experiences or try to perform our work in principled, consistent and readily interpretable ways.” (Stone and Goodyear 1995, pg 17). I would also point out that “principled, consistent and readily interpretable ways” are more amenable to evaluation.

What do these criticisms of constructivist approaches to instruction leave of worth? Something of what may be worth salvaging can be got by looking back at the four principles for building constructivist learning environments mentioned above: context, construction, collaboration and conversation. The issue of context will be discussed in the next subsection (Section 5.1.2). As we have seen, the insights of constructivism (learners constructing their own meaning) lose much of their potency when viewed through the prism of instructional design. The issues of collaboration and (its close relative) conversation will be discussed in Sections 5.2 and 5.3 below.

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<sup>13</sup> There is a very extensive literature on constructivist theories of education. Two good collections of edited articles are Steffe and Gale 1995 and Steffe and Thompson 2000. They are particularly strong on constructivist approaches to teaching/learning in mathematics and the sciences.

<sup>14</sup> Addressing constructivists directly, Dick goes on to say that “The interventions that you are developing have three significant characteristics: They are costly to develop, they require technology to implement, and they are difficult to evaluate. ... The “bells and whistles” associated with your interventions are attractive and fun.” (Dick 1992, pg 97).

### 5.1.2 Criticisms from the Situated Learning Theorists

One of the main criticisms of traditional approaches to instruction made by the situated learning theorists is that it encourages inert learning. According to the situated learning theorists (and their close allies the anchored instruction theorists), inert knowledge is “knowledge that can usually be recalled when people are explicitly asked to do so but it is not used spontaneously in problem solving even though it is relevant” (Cognition and Technology Group at Vanderbilt 1990, pg 2)<sup>15</sup>. I believe that inert learning is a significant problem of current teaching methods. “In algebra, many students fail to appreciate the power of using variables to prove that various principles apply to all cases and not just a few ... In science, students often do not appreciate how new concepts and theories can render perplexing problems solvable ... In the humanities, students often fail to see how sets of classic writings provide important perspectives on current problems.” (Bransford et al 1990, pg 117).

The Cognition and Technology Group at Vanderbilt also claim that “in schools, information was particularly likely to be presented in ways that make it inert” (Cognition and Technology Group at Vanderbilt 1990, pg 2). They attribute this mainly to the ‘decontextualised’ and abstracted way in which knowledge and problems are presented in a school setting.

The solution to the problem of inert knowledge put forward by the situated learning theorists is an approach that focuses on everyday cognition used in authentic tasks in authentic social environments. With regard to everyday cognition, Brown and his colleagues noted how “JPFs [Just Plain Folks] seem particularly adept at solving [problems] within the framework of the context that produced them. ... The problem, the solution and the cognition involved in getting between the two cannot be isolated from the context in which they are embedded.” (Brown et al 1989, pg 36). Authentic tasks are those that naturally emerge from the context in which they are embedded – “Authentic activities then, are most simply defined as the ordinary practices of the culture.” (Brown et al 1989, pg 34). This leads on to the core method for situated learning theorists which is cognitive apprenticeship: “Cognitive apprenticeship methods try to enculturate students into authentic practices through activity and social interaction” (Brown et al 1989, pg 37). The situated learning theorists stress the social nature of this process with the apprentices seen as forming communities of learners. Brown and his colleagues give examples of the use of situated learning for teaching mathematics (Brown et al 1989, pgs37-39). The Cognition and Technology Group at Vanderbilt have examples of the use of technology-based anchored instruction for teaching mathematics, science, philosophy, history, psychology, media studies and ecology (See Bransford et al 1990 and Schwartz et al 1999). However, it should be pointed out that there is a strong leaning in situated learning research into how learning takes place in various professional practices and craftwork (See Chaiklin and Lave 1993).

Situated learning has been the focus of a number of criticisms. Anderson and his colleagues have disputed that learning transfer does not occur. After reviewing the literature, they came up with a more nuanced view of the problem:

Contrary to the claim that knowledge does not transfer between tasks, the evidence we have reviewed supports the following conclusions: (1) Depending upon the experimental situation and the relation of the material originally learned to the transfer situation, there can be either large amounts of transfer, a modest amount, no transfer at all, or even negative transfer. (2) Representation and degree of practice are major determinants of the transfer from one task to

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<sup>15</sup> Both the situated learning and anchored instruction theorists credit the identification of the problem of inert knowledge to A. N. Whitehead (See Brown et al 1989, pg 33 and Cognition and Technology Group at Vanderbilt 1990, pg 2).

another. ... (3) The amount of learning depends on where attention is directed during learning or at transfer. ... (Anderson et al 1996, pgs 7-8).

One lesson which can be taken from this criticism is that, if you want learning transfer, it has to be built into the learning objectives and strategies.

With regard to the situated learning theorists' criticism of the abstracted way in which knowledge is taught in school, Laurillard points out that academic learning entails not just engaging in activities but also "requires learning about descriptions of the world. ... Academic learning requires [the learner] to take a different perspective on those activities, to generalise from them to obtain an abstraction, [which is] a description of the world that does not consist of doing an activity alone." (Laurillard 1993, pgs 22-23). She acknowledges that engaging in multiple activities allows the learner to build an increasingly rich understanding but these activities are not sufficient to ensure that the learner engages in the building of abstract knowledge. She goes on to point out that "The whole point of [academic] knowledge is that being articulated it is known through exposition, argument, interpretation; it is known through reflection on experience<sup>16</sup>" (Laurillard 1993, pg 25). She therefore goes on to say that academic learning must be situated in the domain (with activities that match that domain) and address both the direct experience of the world and the reflection on and abstractions of that experience. Even if the situated learning theorists agreed with this formulation, they would probably argue that there is frequently too little emphasis in schools on the 'direct experience of the world' and too much emphasis on abstractions, which are often taught directly. However, Jones defends the direct teaching of abstractions by saying "The idea of providing abstractions and formalizations in many educational settings is to provide a scaffolding for learning, so that the natural process is rendered less opaque and the time spent deciphering a complex situation is reduced." (Jones 1999, pg 8). After reviewing the literature on the use of abstraction in instruction, Anderson and his colleagues concluded that:

"abstract instruction combined with concrete examples can be a powerful method. This method is especially important when learning must be applied to a wide variety of (frequently unpredictable) future tasks." (Anderson et al 1996, pg 9)

Stone and Goodyear make a telling criticism of the privileging of authentic tasks in situated learning theory:

"there is no reason to think that "artificial" classroom tasks or contexts will in all cases be less effective than "real life" tasks and contexts. The relative austerity of artificial, decontextualised tasks ... may well provide more space for learners to pursue and develop their *own* personal knowledge links." (Stone and Goodyear 1995, pg 17 – italics in original).

Jones makes a similar point and appeals for an empirical description of "situations for learning rather than to artificially divide them into school and authentic practices." (Jones 1999, pg 8). He also makes the point that the 'situatedness' of schools includes a strong emphasis not just on students acquiring knowledge but accredited knowledge. This, of course, is achieved through assessment. Like the constructivists, situated learning do not seem to have a lot to say on assessment.

Finally, Wineburg makes two criticisms of situated learning – one specific and one general. The specific criticism chides situated learning theorists for their idealisation of apprenticeship as a

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<sup>16</sup> These methods of coming to know articulated knowledge will be reviewed in greater depth in Section 5.4 below.

model of authentic learning<sup>17</sup>. “No doubt some apprentices find their apprenticeship absolutely authentic, but I imagine others who find it absolutely tedious, inefficient, repressive, servile, tradition-bound, and in some cases downright mean.” (Wineburg 1989, pg 9). The Cognition and Technology Group at Vanderbilt seem to be aware of this problem when they state that “some of the principles of anchored instruction may make it possible to create learning experiences which are more effective than many that occur in traditional apprenticeship training” (The Cognition and Technology Group at Vanderbilt 1990, pg 2). Wineburg’s more general criticism comes after he speculates as to how schools would have to be re-engineered if situated learning were to be implemented on a grand scale. It is obvious from what he says that such a venture would require substantial resources and involve large changes to school management, teacher training, forms of assessment, etc. and for potential improvements that are far from proven. He concludes that “to survive in the marketplace of ideas, a theory of learning has to be situated in a *theory of schooling*. Otherwise, it may leave its mark on archival journals, but leave the world of classrooms virtually untouched.” (Wineburg 1989, pg 9 – italics in original).

What can we take from situated learning theory to aid the objective of improving pedagogy? First, highlighting the problem of inert knowledge must lead us to question our current instructional strategies and assessment procedures and specifically to address the issue of whether we have learning for transfer built into the instructional design. Second, the emphasis on multiple perspectives (especially by the anchored instruction theorists) is a good antidote to a rigidly sequenced instructional approach found in most distance education study materials. Thirdly, their focus on the social (indeed rhetorical) nature of knowledge acquisition is an important insight, especially of what Laurillard called academic knowledge. This important insight is particularly critical for distance education, given the limited opportunities for social interaction (both student/tutor and student/student) afforded in most second generation distance education. This issue will be discussed in Section 5.4 below. Finally, I believe that the work of the situated learning theorists has particular insights for the area of education commonly called continuing professional development – it is in this area that a number of their ideas (such as knowledge being situated, distributed cognition and legitimate peripheral participation) have a particular resonance.

## 5.2 Can CMC-Based Learning Improve Pedagogy?

As mentioned in the Introduction, many claims are made for the pedagogical advantages of online learning, especially for distance education where it is envisaged that CMC will break down the isolation of the distance learning student. For example, Nixon and Salmon note that with the use of CMC “Geographically isolated students can interact and experience tutoring and support.” (Nixon and Salmon 1996, pg 99).

Among the advantages of CMC mentioned by Jonassen are: (1) socialisation (2) interactive (3) access to instructor (4) not place limited (5) not time limited (6) helps introverts (7) facilitates collaborative learning and (8) facilitates reflection (Jonassen 1996, pgs 178-179). A very similar list of advantages for computer conferencing are given by Mason including (1) interactivity (2) collaborative discussions (3) self-directed approach (4) electronic socialising (5) democratic and equalising tendency (6) time-independent and (7) reflective quality (Mason 1994, pgs 57-58).

While these authors (and others) are aware of the disadvantages of online learning, one is often left with the impression that the disadvantages are far outweighed by the advantages and implementing online learning will *ipso facto* radically improve pedagogy. A fairly typical comment is made by Mason, when looking to the future of computer conferencing she states that

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<sup>17</sup> This idealisation of apprenticeship seems particularly strong in Chapter 3 of Lave and Wenger 1991.

“computer conferencing will be an inexpensive technology, which will continue to grow at grass-roots level. In the short term, conferencing systems ... will find increasing markets, and learners will increasingly have to adapt to the interactive and collaborative paradigm they represent.” (Mason, 1994, pgs 61-62).

The central problem, as I see it, with a lot of the claims that CMC-based online learning helps improve pedagogy is that the grain of the analysis is too coarse. The stated advantages of online learning are put forward without an analysis of their appropriate use. Romiszowski and Ravitz put it this way: “CMC scholarship tends to proudly acclaim the educational merits of this technology for a variety of reasons - access, collaboration, interactivity, self-direction, and experiential learning to name a few - yet few of these are grounded in systematic, rigorous inquiry” (Romiszowski and Ravitz 1997, pg 752).

To see some of the implications of this criticism, let us review three of the following oft-stated advantages of online learning: that use of CMC promotes interactivity, reflection and collaborative learning.

Interactivity is greatly valued, especially in distance education where its relative absence is viewed as a major drawback. Daniel put the issue like this "The major perceived weakness of [second generation distance] education is the extent and immediacy of interaction." (Daniel 1996, pg 57). He goes on to note that the usual way that distance education introduces a substantial element of interaction, i.e. by the provision of face-to-face tutorials, has "two potential drawbacks: they reduced the possibilities of economies of scale and they placed extra constraints of time and place on the student" (Daniel 1996, pg 57).

Mason says “Interactivity is undoubtedly the major advantage of computer conferencing” (Mason 1994, pg57). However, “CMC isn’t inherently interactive but instead depends largely on participation frequency, timely contributions by members, and the nature of messages that are posted.” (Romiszowski and Ravitz 1997, pg 760) In other words, CMC holds the potential to be an interactive medium but whether it is used interactively depends on the active participation of the students (and tutors). Experience would seem to suggest that the level of interactivity is largely determined by the pedagogical techniques used in the online learning. Also, it is frequently assumed that interactivity is always pedagogically beneficial. However, is this always the case? What is actually happening, in learning terms, during interactivity? What distinguishes productive from unproductive interaction? We will return to these questions in Section 5.4.

Reflection is also greatly prized in online learning and cited a major advantage of CMC by numerous authors. For example, because of the asynchronous nature of CMC “Time can be allocated to reflecting on a message before responding, in order to develop one’s arguments or position.” (Jonassen 1996, pg 178). One obvious problem is that it is not known whether reflection has taken place until a student responds, and (unless built into the pedagogical design) there is no way of knowing *a priori* when (or even if) the response will occur. In addition, “the passage of time separating each exchange imposes a ... need for clarity, lack of ambiguity, coherence, etc. in messages.” (Goodyear 1995/1996, pg78). When this is allied to the problem of information overload (see Section 5.3 below) the benefits arising from the use of CMC can be outweighed by the down sides. Thus there is a need to (a) build reflection into the pedagogical design and (b) train users (students and tutors) in the use writing of concise, clear (and short) messages.

The potential of CMC to support collaborative learning has received significant attention (See, for example, Kaye 1991, Crook 1994, McConnell 1994, O’Malley 1995 and Dillenbourg 1999).

Koschmann argues that Computer Supported Collaborative Learning (CSCL) is a new paradigm in the use of computers for learning and, naturally, says that collaborative learning is the model of instruction underlying CSCL (Koschmann 1996)<sup>18</sup>. In defining collaborative learning Dillenbourg says: “The broadest (but unsatisfactory) definition of “collaborative learning” is that it is a *situation* in which *two or more* people *learn* or attempt to learn something *together*”(Dillenbourg 1999, pg2 italics in original). As was the case with interactivity and reflection, one can ask the following questions: When is the use of collaborative learning appropriate? What distinguishes productive from unproductive collaborative learning? Again, these questions will be returned to in Section 5.4.

### 5.3 What Happens When CMC is Implemented in Distance Education Settings?

Many pedagogical strategies can be used in online learning. Kaye gives seven (virtual seminar, online classroom, games and simulations, computer-supported writing, distance education adjunct, lecture room adjunct and educational utility) (Kaye 1991, pgs 6-11). Paulsen gives eleven conferencing techniques (debates, simulations or games, role plays, case studies, discussion groups, transcript based assignments, brainstorming, Delphi techniques, nominal group techniques, forums and projects). (Paulsen 1995, pgs 20-35). However, probably the archetypal use of CMC in education is the online seminar. This has the advantage that providers are basically trying to replicate online something familiar to most teachers/tutors. The following question arises:

“Such teaching methods as seminars ... are traditionally implemented in small or medium-sized face-to-face groups, led by skilled and experienced “facilitators”. Much of the success of these teaching methods is ascribed to the facilitators and the skill with which they focus discussion; guide the approaches adopted by the participants; use the natural group dynamics to stimulate interest, participation and deep involvement; pull together what has been learned in the final debriefing discussion; and so on. Can such participatory discussion methods be effectively orchestrated at a distance, electronically?” (Romiszowski and Ravitz 1997, pg 755)

The simplest answer to this question is yes but at a cost. As noted above, one of the major costs identified in the literature on online learning is tutor workload: “it is now generally agreed that participation in computer conferencing takes up more of a tutor’s time than the equivalent in face to face tuition” (MacKeogh 2000, pg 5). Romiszowski and Ravitz add that “some reports indicate that teachers spend up to twice as long, overall, to deliver a course via computer conferencing as they do to give a course using traditional means” (Romiszowski and Ravitz 1997, pg763) and “Very few institutions currently acknowledge the extra effort and time involved in teaching through CMC with additional payments” (Romiszowski and Ravitz 1997, pg762). Referring to the situation at the UK Open University. Ash and Bacsich report that “Tutors at the UK Open University consistently suggest that they are spending more time supporting learners online than was the case when they supported them through correspondence and telephone contact. ... they are not being paid, or recognised, for this increased workload.” (Ash and Bacsich 2001, pg 32). The latter situation (which would not seem to be uncommon) is, in the longer term, untenable.

Romiszowski and Ravitz discuss work being carried out on the scalability of CMC. However, because of the problem of tutor workload (and because the pedagogical benefits of CMC were found to be highly dependent on the quality and quantity of tutor input), they say that “It is the

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<sup>18</sup> He also says that a number of the learning theories underlie CSCL including theories of situated learning and socially oriented constructivist theories. (Koschmann 1996, pgs 10-13)

conclusion of those involved in these trials [of computer conferencing] that no ideal model has yet been identified for applying the successes [of small group educational computer conferencing] to large courses of 1000 to 5000 students.” (Romiszowski and Ravitz 1997, pg 758). It is interesting to look at the strategies that Romiszowski and Ravitz say are under consideration by the UK Open University to try and overcome the problem of scalability:

- extension and enhancement of peer learning groups
- the use of master classes in which a few students interact with an expert while the remainder only read
- increased input from central academic staff who normally only write courses rather than interact with students
- use of World Wide Web facilities integrated with conferencing facilities
- the development of a few specialist conferencing tutors rather than the expectation that all tutors will be trained and paid for constant conferencing duties.

The extension and enhancement of peer learning is a strategy which I believe has some promise. It will be discussed below in Section 5.5 below. The strategy of using master classes is likely to be untenable in large programmes where all students tend to pay the same fees. In addition, it is against the ethos of opening access which is a key mission of most tertiary distance teaching institutions. Increased use of central academic staff may be an option for the Open University and some other universities which teach solely at a distance but it would not be an option available to most distance teaching institutions, which are dual-mode institutions. Integrating the World Wide Web into computer conferencing is undoubtedly a direction in which computer conferencing systems are going. However, it is as likely to increase tutor workload as decrease it. The development of specialist tutors would lead to some savings in training and equipment. However, a major cost in the educational use of CMC is the online/tutoring costs – it is this cost which is theoretically open ended and therefore the savings from specialist tutors is likely to be marginal. With the possible exception of peer tutoring, it would seem that the above strategies are unlikely to lead to a generalised solution to the scalability problem<sup>19</sup>.

A problem related to tutor overload is student overload. This is particularly evident if students cannot get online for a period. On return, the quantity of contributions can be daunting. Related to student overload is an issue which sometimes can impede critical discussion in CMC. Wegerif relates the experience of an online student who said that “where someone had expressed something in a long and carefully prepared message sent to the conference [the student] felt it would be rude to criticize it without commenting on it fully, and because that would often take too long he tended to let it pass” (Wegerif 1998, pg 9).

Another practical issue in the use of CMC in education (and one which seems paradoxical given the above issues of tutor and student overload) is the problem of low participation rates in online conferences. As Jonassen has noted “when usage is voluntary participation is usually low” (Jonassen 1996, pg 166). Goodyear is interesting on the expectations of course providers “The naïve expectations of the tutor team (myself included) were based on the assumption that course members would spontaneously engage in electronically mediated academic debate.” (Goodyear 1995/1996, pg 87). As might be expected, the course members (students) did not engage in academic debate to any significant extent. The main reason Goodyear puts forward is that “the espoused values of the tutor team were not backed up by their enacted priorities as manifested in assignment tasks and assignment criteria” (Goodyear 1995/1996, pg 87). This centrality of

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<sup>19</sup> Salmon gives a list of tips to help keep the cost of online tutoring down (Salmon 2000, pg 107). However, examination of these tips also leads to the conclusion their implementation would lead to only marginal savings.

assessment is given support by Jones. He researched the use of computer conferencing on a BA in Information Technology and Society programme at Manchester Metropolitan University and concluded that “The most arresting feature of the computer conferencing setting observed was the pervasiveness of the assessment and accreditation procedures.” (Jones 1999, pg 9).

In conclusion, what does the above short reviews of the pedagogical and practical aspects of implementing CMC tell us? To start with the obvious. Implementing CMC on the basis of simply making it available to students is highly unlikely to be successful either as a means of improving pedagogical quality or of overcoming problems such as students sense of isolation. There may be successes where particular groups ‘click’ online but these are likely to be the exception rather than the rule. This was the experience in OSCAIL when students on its two post-graduate programmes were allocated to online groups (in line with their tutorial groups). Despite encouragement to interact online and the valiant attempts of a number of tutors to stimulate online discussion, the participation by students was very low, even for groups of students (such as students temporarily resident abroad) who may have been expected to avail of online tutorial support.

Another conclusion is that, if online learning is to improve pedagogical quality, then we need to know how the various pedagogical processes actually promote higher order learning, especially those processes (such as interactivity, reflection and collaboration) in which online learning has particular strengths. In addition, we need to ensure that the pedagogical techniques used not only engage students in educationally worthwhile processes but also avoid the known pitfalls of tutor and student overload. These issues will be addressed in the next section.

#### **5.4 CMC and Higher Order Learning**

It is a common contention among educators that a key objective of education (especially at third level) should be the teaching of higher order cognitive skills. To quote Howard Gardner “I believe that resources invested in formal education ... can best be justified if ... all students can demonstrate enhanced understanding of the important questions and topics of the world.” (Gardner 1999, pg73).

There is long tradition in research into enhancing understanding through problem solving. (For a short review, see Greeno et al 1996, pgs 22-23 and see Jonassen 2000 for a categorisation of problem types and how they may be integrated into the instructional design process.) This research would seem to be concentrated in the subject areas of mathematics and sciences. While this research has helped with understanding how students tackle problems, there is a fundamental difficulty with it as a means of promoting understanding. As Ohlsson says “successful performance [of problem-solving] is neither a sufficient criterion for, nor a necessary consequence of, understanding” (Ohlsson 1995, pg 50). Ohlsson goes on to point out that a small minority of cognitive researchers have insisted that human beings demonstrate their understanding, not in problem solving, but in the generation of symbols. In particular, he claims, there is a deep connection between abstract knowledge (which he views as the basis of a deep understanding) and discourse. He asks what are the canonical tasks that people carry out when they produce discourse and he suggests the following list of, what he calls, epistemic tasks:

- describing
- explaining
- predicting
- arguing
- critiquing/evaluating
- explicating
- defining (Ohlsson 1995, pg 51)

It is worth drawing attention to the highly social nature of Ohlsson's epistemic tasks. While they can be carried out on an individual basis (self-explanations, arguing with oneself, etc.), they are primarily tasks which are carried out in a social setting.

One interesting aspect of Ohlsson's epistemic tasks is that they seem to be very similar to the processes identified (seemingly independently) by a number of researchers into online and collaborative learning. For example, Crook says that research into peer learning "identifies a number of processes that might be powerful when released in this social situation. I believe there are three that have been well documented ... (1) articulation, (2) conflict and (3) co-construction." (Crook 1994, pg 133). During articulation students make their thinking (opinions, prediction and interpretations) public and explicit. Crook stresses the interactive element of this articulation and posits a number of mechanisms as to how articulation promotes understanding. For example, articulation can be a self-reflective process of learners declaring and justifying their own ideas. Alternatively, "being witness to your own partner engaging in this articulation of ideas [may serve] to create exemplars of strategic moves that comprise effective problem solving" (Crook 1994, pg 134). With regard to conflict, Crook says that "It is a convention of conversation that disagreement should prompt discursive moves of justification and negotiation." (Crook 1994, pg 135) and goes on to say that conflict has "been demonstrated to be a distinctive and productive feature of peer-based problem solving" (Crook 1994, pg 136). An example of co-construction is when students "take individual responsibility for complementary cognitive functions while solving a problem ... [in this way] work gets creatively *dispersed*: strategies of sharing responsibility serve to accelerate the participants joint construction of some worthwhile convergence" (Crook 1994, pg 137 - italics in original).

Salmon is another researcher in online learning who came up something similar to Ohlsson's epistemic tasks. After reviewing the literature, she says that she drew up a list of characteristics of cognitive thinking articulated through (online messages) including:

- offering ideas or resources and inviting critique
- asking challenging questions
- articulating, explaining and supporting positions on issues
- exploring and supporting issues by adding explanations and examples
- reflecting and re-evaluating personal positions
- critiquing, challenging, discussing and expanding ideas of others
- negotiating, interpretations, definitions and meanings
- summarising and modelling previous contributions
- proposing actions based on developed ideas. (Salmon 1998, pgs 6-7)

It is my belief that it is through the type of processes described by Ohlsson, Crook and Salmon that online learning can promote deep understanding. The question therefore arises as how these processes can be implemented online. A possible method will be discussed in the next section (Section 5.4). However, before doing so, I would like to return to the questions asked above about collaborative learning and view collaborative learning through the prism of Ohlsson's epistemic tasks. At the end of Section 5.2, the following questions were asked about collaborative learning: When is the use of collaborative learning appropriate? What distinguishes productive from unproductive collaborative learning?

To answer the first question, I would argue that collaborative learning is particularly appropriate to the teaching and learning of higher order skills. The following quote from Dillenbourg captures the link between collaborative learning and the epistemic tasks: "Collaborative learning is not one single mechanism: if one talks about "learning from collaboration", one should also talk about "learning from being alone". Individual cognitive systems do not learn because they

are individual, but because they perform some activities ( reading, building, predicting, etc.) that trigger some learning mechanisms (induction, deduction, compilation, etc.). Similarly, peers do not learn because they are two, but because they perform some activities that trigger specific learning mechanisms. This includes the activities/mechanisms performed individually, since individual cognition is not suppressed in peer interaction. But, in addition, the interaction among subjects who generates extra activities (explanation, disagreement, mutual regulation, etc.) that trigger extra cognitive mechanisms (knowledge elicitation, internalisation, reduced cognitive load, etc.) The field of collaborative learning is precisely about these activities and mechanisms.” (Dillenbourg 1999, pg 6). It is precisely the extra activities (the epistemic tasks of explanation, disagreement, etc) that trigger the extra cognitive mechanisms that lead to deep understanding. Following on the logic of this argument, the distinguishing mark between productive and unproductive collaborative learning would be the extent to which the participants engage in the epistemic tasks. A lot of interaction in collaborative learning is social in nature and while this serves motivational aspects of task perseverance, I would argue that it the work on the epistemic tasks that will be decisive in fostering higher order skills.

### **5.5 Moderating Skills and Pedagogical Techniques**

Few commentators view teaching online as a straight forward task. “While it is relatively easy to train teachers and tutors to use a CMC system, it is much more difficult to teach the skill of moderating such a course: how to promote discussion, devise activities and encourage interaction.”(Romiszowski and Ravitz 1997, pg 762). Implementing the epistemic tasks demands even greater skills: “meaningful talk is the medium of intellectual development. The management of such a learning environment, however, demands thoughtful preparatory structure and contingent skill. It is a complex organisational task.” (Salmon 1998, pg 4). In addition, the problem of tutor overload, mentioned in Section 5.3 above, has to be addressed. Fortunately, there are pedagogical techniques which may reduce the work load on the online tutor and lessen the range of skills required.

However, before discussing in detail one of these pedagogical techniques, I think it would be useful to put their use in the context of moderating skills. The purpose is to show that teaching online must be an integrated experience for the student and that, attempts to ‘jump into’ what one thinks is the most relevant element is likely to lead to disappointing results. Salmon (1998, pgs5-6) gives the following five stage model of teaching and learning online:

- (1) Access and Motivation: Users need to be able to gain access and get technical support. Moderators need to ensure they are welcomed and motivated
- (2) Online Socialisation: transition for user to successful operating in online environment. This phase may include introductions and introduction to netiquette.
- (3) Information Giving and Receiving: User is finding out what resources are on-line and moderator is acting as assistant. Moderator encourages slow starters and ensures no one participant dominates discussion.
- (4) Knowledge Construction: Moderators and students work together to generate meaning through collaboration
- (5) Development: Students moving towards being independent – moderator progressively withdraws.

I think that the two most important stages are Online Socialisation and Knowledge Construction. With regard to Online Socialisation, Wegerif (using the language of the situated learning theorists) says that “analysis suggests that the key factors supporting learning are those, which make a community, open to newcomers, allowing them to participate in its practices and move from peripheral to central status as smoothly as possible.” (Wegerif, 1998, pg 1). He goes on to

discuss the threshold experience saying “it is the line between feeling part of a community and feeling that one is outside that community looking in.” (Wegerif 1998, pg 6). Only if students pass over the ‘threshold’ will they become active participants in the online learning environment. “The first priority should therefore be to build a sense of community through carefully structured exercises in which differences between students are not so obviously significant.” (Wegerif 1998, pg13).

Knowledge Construction is the core stage. The description of the tutors’ role seems formidable. “The student needs enabling tutors to stimulate conferences, summarise wide-ranging views, providing new topic areas where discussions and interactions go off track, and stimulate new strands, themes and approaches. Tutoring skills related to group building and maintenance become important. The tutor typically undertakes ‘weaving’ the student contributions together, e.g. collecting up statements and relating them to concepts and theories taught on the course, and to forthcoming assignments” (Nixon and Salmon 1996, pg94). It will be obvious that such online moderation would be very time consuming in tutor time.

As mentioned in Section 5.3, there is a wide variety of pedagogical techniques that can be used with online learning. I would like to concentrate on Peer Tutoring as I believe that it has significant potential.

A simple model of online peer tutoring would be as follows<sup>20</sup>:

- Students are registered in a computer conference system in, say, groups of ten
- They are given a series of relevant articles (which could be online)
- Each student is allocated an article and he or she has to produce a summary of a given length
- The summary has to be posted into the conference by a given date and each summary must finish with a set of key points for discussion or questions
- Over the next fixed period, each summariser has to answer questions from their peers on ‘their’ article, if necessary supplementing it from other sources
- It could be made mandatory that each student makes a minimum number of contributions to the online discussions.

This simple model could be expanded in a number of ways. For example, at the end of the fixed period, each student could be asked to assess the tutoring provided by their fellow students and their contributions to the various online discussions. (They could be asked for not just a rating mark but also the criteria they used. In addition, they could be asked to grade each student on a number of Likert items such as incisiveness vs longwinded; relevance of contributions vs irrelevance and netiquette.) This peer assessment may or may not be part of the summative assessment for the course<sup>21</sup>. Another variation of the model would be small groups of students (say 3 or 4) having responsibility for sections of the course. They would have to work together to produce summaries and act as tutors for their sections thus possibly adding to the collaborative knowledge construction aspects of the model.

Giving details of an online learning group based on a model quite similar to the peer tutoring model given above, Goodyear says “the tutors’ only role was in providing the initial structuring of the activity ... This makes this form of electronic seminar highly cost effective in staff time.”

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<sup>20</sup> This model is based on an example given in Goodyear 1995/1996. He calls his model an electronic seminar as he excludes the specifically peer tutoring aspect.

<sup>21</sup> From Goodyear 1995/1996, it would seem important that, at least, the students believe that the peer assessment will have an impact on the final summative assessment.

(Goodyear 1995/1996, pg 91)<sup>22</sup>. He concluded that “participants, given a workable starting structure, ... can evolve the debate principles to underpin effective ways of working.” (Goodyear 1995/1996, pg 98). He also noted that this model may have particular relevance to continuing professional development programmes.

I have spelt out this peer tutoring in some detail because I think it shows how the epistemic tasks may be promoted without major tutor involvement. Student engage in describing/summarising then (hopefully) explanation and explication and maybe debate. Of course, it would have to be determined empirically if these processes do take place.

It should also be pointed out that this model does not exclude the tutor from engaging in the moderating activities outlined above (in this section) by Nixon and Salmon. This could be done during the peer tutoring phase but probably more productively after the peer tutoring phase is over. Then the tutor could stimulate future debate or introduce some of the other pedagogical techniques as appropriate.

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<sup>22</sup> Goodyear does note that the tutors monitored the conference in case of breakdown but even this represented significantly less staff time.

## **6.0 Criteria for Selecting CMC Programmes**

In this final section, I would like to briefly speculate as to some of the criteria which successful online programmes are likely to have.

What are the characteristics of the type of programmes that are particularly suited to online delivery? From the foregoing discussion, some of these characteristics are:

- Programmes at a reasonably high level, probably masters programmes
- Ideally the programmes would be in disciplines which privilege discourse as online learning is structurally suited to promoting discourse
- As fees will tend to be higher than similar open and distance delivered programmes, then the programmes will probably need to aimed at those sectors able to pay substantial fees (business, professions of accounting, law, etc, IT sector)
- Ideally the programmes would be reasonably generic (i.e. not linked to practices or situation in one country) and thus be able to tap into the potential of a world-wide market offered by online learning
- Aimed at continuing professional development as online learning has particular strengths in linking theory and practice.

I think that the key characteristic is the last one. Goodyear and Steeples state that “University-based CPD [Continuing Professional Development] is at its best when it involves a strong interaction between academic research-based knowledge ... and practitioner experience” (Goodyear and Steeples 1999, pg 32). CMC provides a valuable forum for this type of interaction.

## References

- Anderson, John R; Reder, Lynne M and Simon, Herbert (1996) Situated Learning and Education *Educational Researcher* Vol 25, Num 4, pgs 5-11
- Ash, Charlotte and Bacsich, Paul (2001) The Costs of Networked Learning in Jones, Chris and Steeples, Christine (Eds) *Networked Learning: Perspectives and Issues* Springer, Godalming, Surrey, UK
- Bacsich, Paul; Curran, Chris; Fox, Seamus; Hogg, Valarie; Mason, Robin and Rawlings, Adrian (1993) *Telematic Networks for Open and Distance Learning in the Tertiary Sector* (Final Report:1 - mimeo) European Association of Distance Teaching Universities, Heerlen, The Netherlands
- Bates, Anthony (1995) *Technology, Open and Distance Learning* Routledge, London
- Bates, A W (Tony) (2000) *Managing Technological Change: Strategies for College and University Leaders* Jossey-Bass, San Francisco
- Barrows, Howard S (1996) Problem-Based Learning in Medicine and Beyond: A Brief Overview *New Directions in Teaching and Learning* No 68, Winter, pgs 3-12
- Braden, Roberts A (1996) The Case for Linear Instructional Design and Development: A Commentary on Models, Challenges, and Myths. *Educational Technology* March-April 1996 pgs 5-23
- Bransford, John D; Sherwood, Robert D; Hasselbring, Ted S; Kinzer, Charles K and Williams, Susan M (1990) Anchored Instruction: Why We Need It and How Technology Can Help in Nix, Don and Spiro, Rand (Eds) *Cognition, Education, Multimedia Exploring Ideas in High Technology* Lawrence Erlbaum Associates, Hillsdale, New Jersey
- Brown, John Seely; Collins, Allan and Duguid, Paul (1989) Situated Cognition and the Culture of Learning *Educational Researcher* Vol 18, No 1, pgs 32-42
- Chaiklin, Seth and Lave, Jean (1993) *Understanding Practice: Perspectives on Activity and Practice* Cambridge University Press, Cambridge
- Collis Betty (1996) *Telelearning in a Digital World* International Thomson Computer Press, London
- Cognition and Technology Group at Vanderbilt (1990) Anchored instruction and its Relationship to Situated Cognition *Educational Researcher* Vol 19, pgs 2-10
- Crook, Charles (1994) *Computers and the Collaborative Experience of Learning* Routledge, London
- Curran, Chris (1997) ODL and Traditional Universities: Dichotomy or Convergence? *European Journal of Education* Vol 32, Num 4, pgs 335-346
- Curran, Chris (2001) The Phenomenon of On-line Learning *European Journal of Education* Vol 36, Num 2, pgs 113-132

Curran, Chris and Fox, Seamus (1999) *Telematics in Open and Distance Learning* Deutscher Studien Verlag, Weinheim

Daniel, John S (1996) *Mega-Universities and Knowledge Media: Technology Strategies for Higher Education* Kogan Page, London

Dick, Walter (1992) An Instructional Designer's View of Constructivism in Duffy, Thomas M and Jonassen, David H (Eds) *Constructivism and the Technology of Instruction: A Conversation* Lawrence Erlbaum Associates, Hillsdale, New Jersey

Dillenbourg, Pierre (1999) What do we mean by "Collaborative Learning"? in Dillenbourg, Pierre (Ed) *Collaborative Learning: Cognitive and Computational Aspects* Pergamon, Amsterdam

Gardner, Howard E (1999) Multiple Approaches to Understanding in Reigeluth, Charles M (Ed) *Instructional-Design Theories and Models A New Paradigm of Instructional Theory Volume II* Lawrence Erlbaum Associates, Mahwah, New Jersey

Goodyear, Peter (1995/6) Asynchronous Peer Interaction in Distance Education: The Evolution of Goals, Practices, and Technology *Training Research Journal* Vol 1, pgs 71-102

Goodyear, Peter and Steeples, Christine (1999) Asynchronous Multimedia Conferencing in Continuous Professional Development *Distance Education* Vol 20, No 1, pgs 31-38

Green, Kenneth C (2000) The Campus Computing Project Available at: <http://campuscomputing.net/summaries/2000/index> Accessed: 19/01/2002

Greeno, James G; Collins, Allan M and Resnick, Lauren B (1996) Cognition and Learning in Berliner, David C and Calfee, Robert C (Eds) *Handbook of Educational Psychology* Simon and Schuster Macmillan, New York

Harasim, Linda; Hiltz, Starr Roxanne; Teles, Lucio and Turoff, Murray (1995) *Learning Networks: A Field Guide to Teaching and Learning Online* MIT Press, Cambridge, Massachusetts

Jonassen, David (1996) *Computers in the Classroom: Mindtools for Critical Thinking* Merrill, Prentice Hall, Englewood Heights, New Jersey

Jonassen, David (2000) Toward a Design Theory of Problem Solving *Educational Technology Research and Development* Vol 48, Num 4, pgs 63-85

Jonassen, David; Davidson, Mark; Collins, Mauri; Campbell, John and Bannan Haag, Brenda (1995) Constructivism and Computer-Mediated Communication in Distance Education *The American Journal of Distance Education* Vol 9, No 2, pgs 7-26

Jones Chris (1999) *Taking without Consent: Stolen Knowledge and the Place of Abstractions and Assessment in Situated Learning* Available at: <http://domino.lanacs.ac.uk/edres/csaltdocs.nsf> Accessed: 22/1/2001

Jones, Chris and Steeples, Christine (2001) Perspectives and Issues in Networked Learning in Jones, Chris and Steeples, Christine (Eds) *Networked Learning: Perspectives and Issues* Springer, Godalming, Surrey, UK

Kaye, Anthony (1989) Computer-Mediated Communication in Distance Education in Mason, Robin and Kaye, Anthony (Eds) *Mindweave: Communication, Computers and Distance Education* Pergamon Press, London

Kaye, Anthony (1991) (Ed) *Collaborative Learning through Computer Conferencing: The Najaden Papers* NATO ASI Series, Springer-Verlag, Berlin

Kember, David (1995) *Open Learning Courses for Adults: a Model of Student Progress* Educational Technology Publications, Englewood Cliffs, NJ

Kim S H (1985) The Role of Distance Teaching Universities in Innovation of Higher Education Today in Korea Air and Correspondence University *Articles on the Korea Air and Correspondence University and Related Issues* Institute of Lifelong Education, Korea Air and Correspondence University, Seoul

King, Bruce; McCausland, Holly and Nunan, Ted (2001) Converting to Online Course and Program Delivery: The University of South Australia Case Study *International Review of Research in Open and Distance Learning* Vol 1, No 2

Koschmann, Timothy (1996) Paradigm Shifts and Instructional Technology: An Introduction in Koschmann, Timothy (Ed) *CSCL: Theory and Practice of an Emerging Paradigm* Lawrence Erlbaum Associates, Mahwah, New Jersey

Laurillard, Diana (1993) *Rethinking University Teaching* Routledge, London

Lave, Jean and Wenger, Ettiienne (1991) *Situated Learning: Legitimate Peripheral Participation* Cambridge University Press, Cambridge

Lumsden, Keith G and Ritchie, Charles (1975) The Open University: A Survey and Analysis *Instructional Science* Vol 4, pgs 237-291

Lynch, Kathleen; Brannick, Teresa; Clancy, Patrick and Drudy, Sheelagh (1999) *Points and Performance in Higher Education: A Study of the Predictive Validity of the Points System* Department of Education and Science, Dublin

MacKeogh, Kay (2000) *Access, Expertise, Attitudes and ICTs in the Humanities: An Irish Case Study* Paper presented at EADTU Conference *Wiring the Ivory Tower*, Paris, September 2000

Mason, Robin (1994) *Using Communications Media in Open and Flexible Learning* Kogan Page, London.

McConnell, David (1994) *Implementing Computer Supported Cooperative Learning* Kogan Page, London

Muta, Hiromitsu (1984) *The Economics of the University of the Air of Japan* Working Paper HM-84-07, National Institute for Educational Research, Tokyo.

Muta, Hiromitsu and Sakamoto, Takashi (1989) The Economics of the University of the Air of Japan Revisited *Higher Education* Vol 18, pgs 585-611.

Nipper, Soren (1989) *Third Generation Distance Learning and Computer Conferencing* in Mason, Robin and Kaye, Anthony (Eds) *Mindweave: Communication, Computers and Distance Education* Pergamon Press, London

Nixon, Tony and Salmon, Gilly (1996) *Computer-mediated learning and its potential* in Mills, Roger and Tait, Alan (Eds) *Supporting the Learner in Open and Distance Learning* Pitman Publishing, London

Ohlsson, Stellan (1995) *Learning To Do And Learning To Understand: A Lesson And Challenge For Cognitive Modeling* in Reimann, Peter and Spada, Hans (Eds) *Learning In Humans And Machines: Towards An Interdisciplinary Learning Science* Pergamon, London

O'Malley, Claire (1995) *Computer Supported Collaborative Learning* NATO ASI Series, Springer-Verlag, Berlin

Paulsen, Morton (1995) *The Online Report on Pedagogical Techniques for Computer-Mediated Communication* Available at: <http://www.nettskolen.com/alle/forskning/19/cmcped.html> Accessed: 20/01/2001

Perraton, Hilary (1982) *The Cost of Distance Education* IEC Broadsheets on Distance Learning No. 17, International Extension College

Phelps, Ruth H; Wells, Rosalie A; Ashworth, Robert L and Hahn A Heidi (1991) *Effectiveness and Costs of Distance Education Using Computer-Mediated Communication* *American Journal of Distance Education* Vol 5 No 3 pgs 7-19.

Romiszowski, Alexander and Ravitz, Jason (1997) *Computer Mediated Communication in Dills, Charles and Romiszowski, Alexander (Eds) Instructional Development Paradigms* Educational Technology Publications, Englewood Cliffs, New Jersey

Rumble, Greville (1999) *The Costs of Networked Learning: What have we Learnt* Paper Presented at FLISH99 Conference Available at: <http://www.shu.ac.uk/flish/rumblep.htm> Accessed: 27/09/01

Salmon, Gilly (1998) *Developing Learning through Effective Online Moderation* *Active Learning* No. 9, pgs 3-8

Salmon, Gilly (2000) *E-Moderating: the key to Teaching and Learning Online* Kogan Page, London

Schwartz, Daniel L; Lin, Xiaodong; Brophy, Sean and Bransford, John D (1999) *Towards the Development of Flexibly Adaptive Instructional Designs* in Reigeluth, Charles M (Ed) *Instructional-Design Theories and Models A New Paradigm of Instructional Theory Volume II* Lawrence Erlbaum Associates, Mahwah, New Jersey

Steffe, Leslie P and Gale, Jerry (1995) (Eds) *Constructivism in Education* Lawrence Erlbaum Associates, Hillsdale, New Jersey

Steffe, Leslie P and Thompson, Patrick W (2000) (Eds) *Radical Constructivism in Action Building on the Pioneering Work of Ernst von Glassersfeld* Routledge, New York

- Stone, Carolyn and Goodyear, Peter (1995) *Constructivism and Instructional Design: Epistemology and the Construction of Meaning* Available at:  
<http://domino.lanacs.ac.uk/EdRes/CSALTDocs.nsf> Accessed: 22/01/2001
- Thompson, Chris (2001) *The State of e-Learning in the States* Available at:  
[http://www.nga.org/center/divisions/1,1188,T\\_CEN\\_ESS^C\\_ISSUE\\_BRIEF^D\\_2125,00.html](http://www.nga.org/center/divisions/1,1188,T_CEN_ESS^C_ISSUE_BRIEF^D_2125,00.html)  
Accessed: 22/06/2001
- Wagner, Leslie (1972) The Economics of the Open University *Higher Education* Vol 2, pgs 159-183.
- Wagner, Leslie (1977) The Economics of the Open University Revisited *Higher Education* Vol 6, pgs 359-381.
- Webb, Greg (2000) What Next? Cutting Back after Three Years of Online Delivery Available at:  
<http://vc.tafensw.edu.au/site/it/library/00webb01/00webb01.htm> Accessed: 14/11/2000
- Wegerif, Rupert (1998) *The Social Dimension of Asynchronous Learning Networks* Available at:  
[http://www.aln.org/alnweb/journal/vol2\\_issue1/wegerit.htm](http://www.aln.org/alnweb/journal/vol2_issue1/wegerit.htm) Accessed: 22/01/2001
- Wells, Rosalie (1993) *Computer-Mediated Communication for Distance Education: An International Review of Design, Teaching and Institutional Issues* ACSDE Research Monograph No 6, Pennsylvania State University, PA
- Wineburg, Samuel S (1989) Remembrance of Theories Past *Educational Researcher* Vol 18, No 4, pgs 7-10
- Wiske, Martha Stone (1997) Introduction: The Importance of Understanding in Wiske, Martha Stone (Ed) *Teaching for Understanding* Jossey-Bass Publishers, San Francisco