

# HOT and Flaming Spirals: Learning and Empathic Interfaces in Discussion Forum Text-based Dialogues

Stylianos Hatzipanagos [s.hatzipanagos@kcl.ac.uk]  
King's Institute of Learning and Teaching, King's College London,  
Franklin-Wilkins Building, Waterloo Road, London,  
SE1 9NH, United Kingdom [http://www.kcl.ac.uk]

## Abstract

The paper describes a case study devised to create frameworks for effective Computer Mediated Communication within the context of resource-based learning in higher education. It investigates the hypothesis that effective use of online discussion forums can complement face to face learning and teaching by engaging the students in discussion-based collaborative activities. Additionally, it explores the relationship between higher order thinking and adherence to a set of communication principles in discussion forum text-based data. The claim is that the effectiveness of such learning environments is enhanced when supported by interfaces which equally emphasise the cognitive and the affective aspects of learning.

## Keywords

Computer Mediated Communication, interactive learning environments, collaborative learning, higher order thinking, text-based discussion forum content analysis.

## Introduction

Computer Mediated Communication (CMC) is used in virtual learning environments, to facilitate the creation of learning communities, either in open and distance learning (ODL) courses or resource-based learning (RBL) contexts (Hatzipanagos et al 2003a). RBL is defined as an integrated set of strategies to promote student-centred learning in a mass education context, through a combination of specially designed learning resources and interactive media and technologies (NCODE 2004).

In distance learning, CMC is the main medium of communication, that maybe implemented in combination with face to face contact between students and tutors. Whereas, in a campus-based context, the dominant assumption is that it can only be a secondary source of communication, whose advantage is that it complements face to face teaching. A common format of CMC communication is group work in synchronous (with virtually no time delay, allowing participants to respond in real time) and asynchronous (with a time delay, allowing participants to respond at their own convenience), mostly text-based discussion forums.

The claims made for the educational value of CMC rest on the assumption that students learn effectively through discussion and collaboration (Laurillard 2001). The emphasis has been on the concept of learning 'anytime, anywhere' and the flexibility that this provides for the autonomous learner (Preece 2000). Elsewhere, research has highlighted the implications of the formation of 'communities of practice' where participants pursue shared enterprises over time and engage in social practice which is considered to be the fundamental process by which we learn (Wenger 1998). In those environments, the online communities provide support to student interactions. Additionally, data generated by CMC technologies offer an important source for educational research.

However, there are certain pre-requisites for effective CMC. Flexibility of access and the ability of the participants of an online tutorial group to use CMC are essential for effective participation in a discussion forum. In addition, participants have to use text instead of speech as in a face to face context, which can result in poor communication due to lack of context and appropriate body language.

This paper describes a case study devised to create frameworks for effective CMC. The objective was to locate and highlight evidence of higher order thinking in discussion forum contributions. The concept of 'empathic interfaces' is introduced and it is described how they can support learning. The findings are presented in terms of objective (quantitative analysis), semi-quantitative and content (qualitative) analysis and interjudge reliability.

## Higher order thinking

In the context of higher education, there is increasingly an emphasis on learning environments where the learner plays an active role and is supported to develop skills, which can be characterised as:

- cognitive where cognition relates to understanding, reasoning, critical thinking, problem solving skills (McLoughlin & Oliver 1998) and whether students focus in the intrinsic functions of educational experiences (Entwistle and Ramsden 1983).
- Metacognitive where metacognition relates to knowledge of one's own cognition and learning, and the ability to monitor and regulate them (Hara, Bonk & Angeli, 2000).

*Both sets of skills are* required for higher order thinking (HOT). HOT is not easy to define but can be recognised when encountered (McLoughlin & Oliver 1998) by the use of appropriate content analysis methodologies.

## Frameworks to determine HOT

Different methodologies of content analysis have attempted to determine whether HOT can be distinguished within transcripts of dialogue. Approaches range from those that are student centred, collaborative (Gunawardena et al 1997) to others, which are based on cognitive outcomes, determined by a teacher (Biggs & Collis 1982; Ramsden 1992). The limitations of other methods such as Henri's (1992) who explored educational quality of messages using a content analysis model based on dimensions of social, interactive, cognitive and metacognitive, have been that they were designed for contexts where there was a strong teacher presence, thus making them not applicable to a learner-centred online conferencing environment (Luca & McLoughlin 2003).

A framework commonly used to recognise HOT is Biggs' SOLO taxonomy (1999). SOLO (an acronym for 'Structure of the Observed Learning Outcome') is a hierarchy that contains the levels of outcome, which are used to classify the structural complexity of students' responses (Schrire 2005). SOLO differentiates between in-depth and surface processing of material learnt, by placing students' responses into predetermined, hierarchical categories according to the quality of their answers (Table 1). It differentiates between Prestructural, Unistructural, Multistructural, Relational and Extended abstract levels of outcomes.

**Table 1.** Levels of Biggs's SOLO taxonomy (from Biggs, 1999)

Level of Outcome	Indicators
1. Prestructural	Use of irrelevant information, or no meaningful response.
2. Unistructural	Focuses on one relevant aspect only.
3. Multistructural	Focuses on several relevant aspects, but they are not co-ordinated together.
4. Relational	The several parts are integrated into a coherent whole: details are linked to conclusion; meaning understood
5. Extended Abstract	Answer generalises the structure beyond the information given: Higher order principles are used to bring in a new and broader set of issues.

Hierarchies such as Biggs' have been criticised for ruling out the possibility that socially interactive functions are acknowledged as part of cognitive development (McLoughlin & Panko 2002). However the SOLO taxonomy was chosen as an appropriate tool for this case study because:

- categories are not discipline specific but are assumed to apply to any kind of subject matter;
- categories are well defined, thus overlap of levels of outcomes can be avoided;
- there is a clear dividing line, according to Biggs(1999), between levels 3 and 4, 5, marking the transition from increasing knowledge (quantitative: unistructural becoming increasingly multistructural) to deepening understanding (qualitative: relational, then extended abstract, corresponding to HOT).

The discussion will now turn to setting up CMC activities and ways to support effective communication.

### Setting up effective CMC activities

CMC in campus-based settings is advocated as a way of dealing with large numbers of students (Light et al 2000), where online discussions run in parallel to face to face tutorials.

E-mail conferencing in asynchronous discussion forums is considered to be an effective medium for enhancing communication because it potentially allows or encourages HOT by providing an additional communication channel to students, leading to more sophisticated arguments and allowing reflection which cannot probably take place in synchronous face to face sessions. Productive interactions are communication exchanges between students that are characterised by occurrences of HOT.

In previous work (Hatzipanagos et al 2002), it was reported that discussion forums are used effectively when they are set up in a way that facilitates communication in small groups and activities are linked to assessment to encourage participation. CMC set-ups usually include:

- A prescriptive orchestration of activities set by the tutor.
- The active involvement of the tutor, monitoring, e-moderating (Mason 1991; Salmon 2002).

Warren and Rada (1998) suggest that the active involvement of the tutor may be a necessary condition for productive interaction; however, CMC exchanges have also been held to be of value with much lower levels of tutor engagement (Light et al 2000).

CMC exchanges consist of the formal content of a message and affective/social components, acknowledged as part of cognitive development. Such exchanges take place within systems with interfaces whose fragmentation does not allow connections between the cognitive and the affective aspects of learning.

### The empathic interface and communication principles

Research has emphasised that positive and supportive interaction is essential to the development of self-esteem and the scaffolding of learning (Cooper 2001), and that in learning environments emotional interchange increases engagement and understanding (Cooper & Brna 2002). In terms of student learning and communicative media, 'empathic' are defined as those interfaces that support effective communication in educational practices. The principles of good communication in a discussion forum are similar to face to face communication. The main principle, which is of significant interest for online communication, according to Zimmer & Alexander (1996), is that shared understanding means to understand other people's views rather than simply focussing on self-expression or even worse imposing one's views on others. Particularly in a CMC specific context being able to construct a grammatical utterance is not sufficient for effective communication. In addition, paralinguistic clues as to speakers' intentions are not available, except through combinations of keystrokes (emoticons i.e. symbols used in CMC to represent emotions) or possibly the use of typeface emphasis such as italics, bold or capital letters (McAteer & Harris 2002). As Frake (1972) points out more than a grammar and a lexicon is required; what is needed is an ethnography of speaking: a specification of what kinds of things to say in what message forms to what kinds of people in what kind of situations.

Research in this area has engaged in a dialogue with Roger's work on supportive communication (Rogers 1959). The starting point has been his principles of supportive communication (Rogers 1962). To increase their usability in the context of student learning, Zimmer & Alexander (2000) referred to them as Practical

Communication Principles (PCPs) and summarised them as:

- PCP1: Thank, acknowledge and support people freely: it is related to acknowledgement of a message from other participants. The assumption is that people who know that they have been appreciated will be encouraged to contribute further.
- PCP2: Acknowledge before differing: it is related to reaching a mutual understanding by re-stating what the other person has said in one's own words.
- PCP3: Speak from your own perspective (or at least from some specified perspective): in order to avoid an impersonal style of response

Additionally Zimmer & Alexander (2000) enhanced the PCPs by considering a number of principles of good practice that had grown up in the computer conferencing community such as: occurrence of conflicts where messages are posted, usually in the social context of a discussion forum, that are deliberately hostile and insulting, so-called 'flaming spirals' and the use of emoticons as widely accepted conventions to convey emotions and moderate expressions.

In the following section, a case study is presented in order to illustrate how observing PCPs can support effective use of online communication and foster higher order learning.

## Case study

In the School of Computing Science of a London university, the existing programmes were adapted for Web delivery (Woodman et al 2001). The adapted learning materials and support mechanisms, aimed initially at an overseas audience for ODL, were also utilised in a RBL format for on-campus students studying in London (Hatzipanagos et al 2002). The range of resources included a Virtual Learning Environment (VLE) with communication tools: asynchronous discussion forums, synchronous virtual chat rooms and email.

This case study dealt with a particular MSc course aimed to equip students with a solid background in core technologies used in Internet Commerce systems. The course combined practical and theoretical aspects about an e-business infrastructure and was based on a blended learning model where (Hatzipanagos et al 2003b):

- face to face teaching for local students was in large-group lectures;
- labs/seminars were used to help students through the programming aspect of the course. The students were divided into groups of 15 to 20 for the seminars;
- weekly study included reading, programming, using online discussion forums and completing weekly online quizzes;
- one coursework was submitted and assessed via the VLE.

To achieve the learning outcomes, students were asked to participate in group work online. To this purpose discussion forums were set up, associated with the face to face lab/seminar groups to consolidate the virtual communities by the activities of the physical ones. The online activities were linked to assessment to encourage participation and were designed as a mixture of contributions to the online forum, self and peer evaluation.

Tutors were engaged in 'orchestrating' the learning process. The discussion forums were unmoderated though supervised by the tutors. The students within each group were asked to post a minimum of three messages relevant to the discussion topic as part of their coursework, and respond to the messages posted by their fellow students in the same group. After the end of the group discussion the students were asked as part of their assignment to evaluate the quality of group work in their seminar group and also to evaluate their contribution. Students were exposed to the communication principles through discussion in the face to face tutorials.

## Methodology of the study

The three core components of this research explored the following questions:

- Does CMC complement face to face learning by creating appropriate conditions for learning?
- Is there evidence of HOT in text-based discussion forums?
- Do PCPs support effective use of online communication? Do PCPs enhance the occurrence of HOT in discussion forums?

A combination of qualitative and quantitative approaches was selected. As such a case study strategy appeared to be the appropriate method to utilise (Yin 2003), by enabling action and events to be set within context by examining one selected setting.

Discussion forums were selected for content analysis and a framework was devised to analyse the transcripts. The quantitative analysis focused on the total number of messages posted on the discussion forums during an academic term; the number and the proportion of the total student population who posted messages; how frequently the students posted messages on the discussion forum and whether some students posted messages more frequently than others.

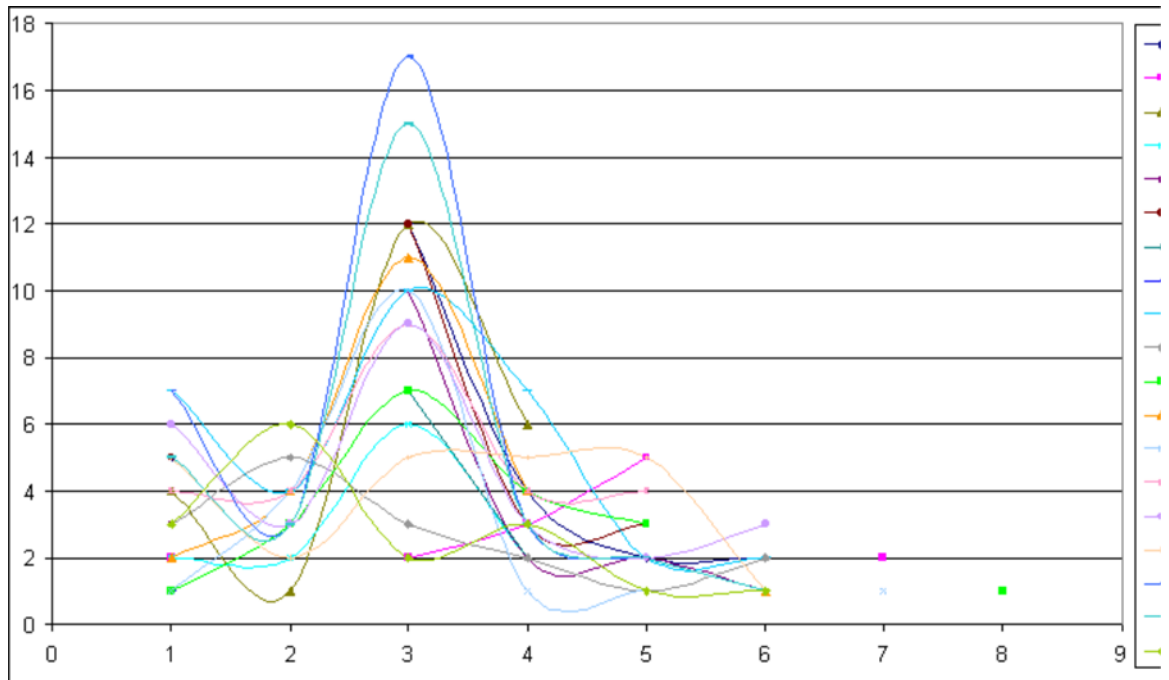
The content analysis comprised: a qualitative investigation of occurrences of HOT in discussion forum contributions and a semi-quantitative investigation of adherence to PCPs. In content analysis (Berelson 1952), there is no consensus on what constitutes a unit (i.e. an autonomous study sample) for analysis. Methodological approaches range from defining units based on syntactical or grammatical criteria such as sentence unit or paragraph unit. The advantage of a paragraph unit is that it reduces significantly the number of cases. An alternative approach centres on thematic units where the emphasis is not on size but on units of meaning; however, this has implications for interfragmentation of thematic units, subjectivity and reliability of the fragmentation process (Rourke et al 2001).

An interjudge reliability of HOT ratings was ensured by the use of Cohen's kappa (1960; 1968), for interjudge agreement (the two researchers involved in analysing the data looked at the online material separately). Interjudge discrepancies were resolved by negotiation.

The semi-quantitative analysis looked at whether the communication principles were obeyed consistently and whether there was a correlation between evidence of HOT and communication governed by communication principles

## Findings

This section quantifies the collaborative interaction between the students. In total 1825 messages were posted on the discussion forums by both staff and students during the 12 weeks of the term. The main section contains introductory messages, general course postings, and administrative messages.



**Figure 1.** Distribution of student participation to discussion and the number of messages posted.

Figure 1 shows an asymptotic representation of the number of messages posted in each seminar group, where the number of messages posted peaks at three. The horizontal axis represents the number of messages posted by each student, and the vertical axis shows the number of students in the group who posted one, two, three or more messages (up to nine messages). Most students (159) posted three messages, which were required by their coursework. The minimum requirement of three messages did not however limit all students in posting further messages, and as can be seen from Figure 1 a considerable number of students posted four, five and six messages, and a minority posted seven or eight messages. There was a third category of students who posted less than the required number of messages.

Some tendencies in student behaviour were observed during data collection and, though they were not part of the original methodological approach, indicated that:

- Students seemed to prefer a combination of face to face communication and asynchronous tools to synchronous chat rooms (Hatzipanagos 2005).
- There was reluctance to spend time discussing online and it seemed that an extrinsic motivation factor was the link to assessment.
- Linking activities to assessments was successful in encouraging participation. However, it seemed to dictate the format of the contributions. Students constructed messages in the format of academic essays (particularly in the introductory first one) with introduction, body and conclusion.

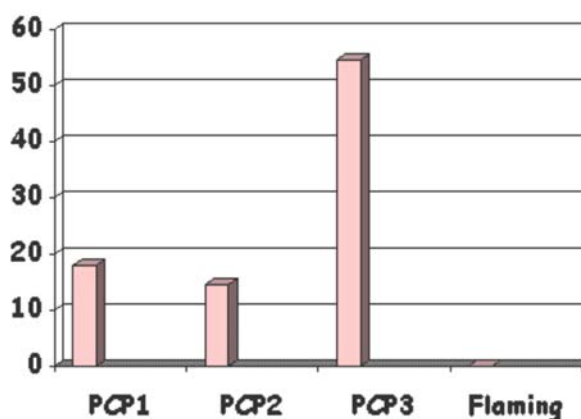
Two evaluators investigated evidence of HOT in two randomly selected discussion forums. The results of the evaluation indicated that email conferencing supports HOT: there was a considerable proportion of high-level ratings, an average of 44.71% for discussion forum 1 and an average of 45.1% for discussion forum 2 (Table 2). Additionally, there was a fair to good agreement between the two evaluators. Cohen's kappa for interjudge agreement was 0.70, a value which represents agreement beyond chance.

**Table 2.** Higher order thinking distribution in two discussion forums.

Discussion forum 1		
Level of Outcome	No of Occurrences Evaluator 1	No of Occurrences Evaluator 2
1. Prestructural	4	4
2. Unistructural	18	21
3. Multistructural	36	32
4. Relational	30	34
5. Extended Abstract	16	13
Total	104	
Discussion forum 2		
Level of Outcome	No of Occurrences Evaluator 1	No of Occurrences Evaluator 2

1. Prestructural	1	2
2. Unistructural	16	17
3. Multistructural	11	9
4. Relational	15	17
5. Extended Abstract	8	6
Total	51	

Figure 2 shows adherence to communication principles in the above two discussion forums.



**Figure 2.** Adherence to communication principles.

In terms of adherence to the communication principles, there were the following trends:

1. PCP1 and PCP2 were partially obeyed (18% of contributions adhered to PCP1 and 14.67% to PCP2).
2. Nearly half the messages (53%) did not refer to the messages of any others at all.
3. 54.67% of messages adhered to PCP3
4. Only 7 messages actually contradicted/argued against what other contributors had said.
5. There was no evidence of flaming spirals.
6. There were no emoticons used.

On the other hand, there was a minority of students who were much more involved in the communication, each sending several messages. Thus one third of the messages referred to other messages or other writers. They picked up each other's phrases as people do in conversations creating associations to PCP1 and PCP2. In addition there were 11 occurrences of "I conclude..." and some contributors addressed their messages to "my friends".

Overall there was a conflict between adherence to PCPs and increased 'traffic': the high volume of contributions seemed to influence the immediacy of communication. Complementarity of face to face and online communication in student groups may have also influenced the format of those contributions that were elliptical in the discussion forums.

## Conclusion

VLEs provide templates of learning environments, which can be populated by those attributes that educators consider essential for learning to take place and permit students to acquire cognitive and metacognitive skills. The disjunction between content and communication in these environments can be bridged by online activities that engage learners. In these environments, asynchronous text-based communication can foster higher order learning via peer interaction. Discussion forums allow participants to collaborate and explore issues in depth. However, such systems may suffer from interfaces whose fragmentation does not allow connections between the cognitive and the affective aspects of learning.

The idiosyncrasies that the RBL environment imposed on this case study meant that there was a balance of face to face and online communication. To investigate higher order thinking in asynchronous, text-based email conferencing the SOLO taxonomy was used. SOLO represents an appropriate framework for recognising HOT in higher education learning however, research has highlighted its potential shortcomings as it rules out the affective aspect of learning which seems to contribute equally to cognitive development (McLoughlin & Panko 2002). The combination of the SOLO hierarchy with the Rogers-inspired communication PCPs addressed the disjunction between the cognitive and the affective in CMC interfaces.

The collected data, transcripts of asynchronous, text-based dialogues were analysed. A number of different measures and techniques were employed to provide a complete picture of these online interactions. The content analysis of the contributions in the discussion forums, using Biggs's SOLO taxonomy as a reference tool, indicated clear evidence of higher order thinking. This assisted in highlighting the importance of discussion forums in an RBL setting.

The analysis of the same contributions but from the point of view of adherence to a CMC netiquette framework highlighted as well the importance of the Communication Principles, which provided a framework for effective communication even if they were partially obeyed.

In the context of higher education, orchestration of learning activities and setting the appropriate rules of interaction can contribute greatly to student attainment and quality of communication. This finding points to the need to make students aware of these communication principles in order to ensure that they

communicate effectively in the VLE.

This type of research would be enhanced greatly by also examining DL students and compare patterns of online behaviour to those of campus based students. If a major impact of educational research is to inform practice, the outcome of such comparisons should help to monitor and detect issues needing attention in distance learning environments. It is easier to detect problems "closer to home".

## Acknowledgements

I would like to thank my colleagues from Middlesex University, Maia Dimitrova, Pav Chera, Chris Sadler, Maya Milankovic-Atkinson, Alan Murphy and Wala Bakry for their contribution in analysing the data on which this paper was based.

## References

- [1] Berelson, B. (1952). *Content analysis in communication research*. Illinois: Free Press.
- [2] Biggs, J.B., & Collis, K.E. (1982). *Evaluating the quality of learning: The SOLO taxonomy*. New York: Academic Press.
- [3] Biggs J. (1999). *Teaching for Quality Learning at University. What the Student Does*. 1st ed. Buckingham, UK: Open University Press.
- [4] Cohen, J. (1960). A coefficient of agreement for nominal scales. *Educational and Psychological Measurement*, 20, 37-46.
- [5] Cohen, J. (1968). Weighted kappa: Nominal scale agreement with provision for scaled disagreement or partial credit. *Psychological Bulletin*, 70, 213-220.
- [6] Cooper, B. (2001). Supporting high quality interaction and motivation in the classroom using ICT: the social and emotional learning and engagement in the NIMIS project. Paper presented at BERA 2001, Leeds, UK.
- [7] Cooper, B. and P. Brna (2002). Hidden curriculum, hidden feelings; emotions, relationships and learning with ICT and the whole child. Paper presented at BERA 2002, UK.
- [8] Entwistle, N. and P. Ramsden (1983). *Understanding Student Learning*. London: Croom Helm.
- [9] Frake, C.O. (1972). How to ask for a Drink in Subanum. In Giglioli, P.P. (Ed.), *Language and social context* (pp. 87-94). London: Penguin.
- [10] Gunawardena, C., Lowe, C. & Anderson, T. (1997). Analysis of a global online debate and the development of an interaction analysis model for examining social construction of knowledge in computer conferencing. *Journal of Educational Computing Research*, 17(4), 395-429.
- [11] Hara, N., Bonk, C., & Angeli, C. (2000). Content analysis of online discussion in an applied educational psychology course. *Instructional Science*, 28(2), 115-152.
- [12] Hatzipanagos, S. Sadler, C., Milankovic-Atkinson M., Murphy, A. Bakry, W. (2002). Distance Learning Comes Home: Resource-based learning for Campus-based Students. In *Proceedings of World Conference on Educational Multimedia, Hypermedia and Telecommunications 2002* (pp. 719-724). Norfolk, VA: AACE.
- [13] Hatzipanagos, S., Sadler, C., Dimitrova, M., Milankovic-Atkinson, M., Chera, P., Murphy, A., & Bakry, W. (2003a). Blended learning for Computer Science Education: a Conceptual Framework and a Case Study. In *Proceedings of World Conference on Educational Multimedia, Hypermedia and Telecommunications 2003* (pp. 2397-2404). Norfolk, VA: AACE.
- [14] Hatzipanagos, S., Dimitrova, M., Sadler, S., Chera, P., Milankovic-Atkinson, M. Murphy, A., Bakry, W.M. (2003b). Communication Protocols for Online Learning: Groupwork and Dialogues in Discussion Forums. In *Proceedings of CAL 2003*, Belfast, Ireland.
- [15] Hatzipanagos, S. (2005). Empathic Interfaces and Communication Protocols: Groupwork and Dialogues in Discussion Forums. In *Proceedings of World Conference on Educational Multimedia, Hypermedia and Telecommunications 2005* (pp. 2004-2011). Norfolk, VA: AACE.
- [16] Henri, F. (1992). Computer Conferencing and Content Analysis. In Kaye, A.R. (Ed.), *Collaborative learning through computer conferencing* (pp. 117-136). Berlin: Springer.
- [17] Laurillard, D. (2001). *Rethinking University Teaching: A framework for the effective use of educational technology*. London: Routledge Publishers.
- [18] Light, V., Nesbitt, E., Light, P., Burns, J.R. (2000). 'Let's you and me have a little discussion': computer mediated communication in support of campus-based university courses. *Studies in Higher Education*, 25(1), 85-96.
- [19] Luca, J. and C. McLoughlin (2003). Using Online Forums to support a community of Learning. ED-MEDIA, Lugano.
- [20] Mason, R. (1991). Moderating Educational Computer Conferencing. DEOSNEWS 1(19).
- [21] McAteer, E. and Harris, R. (2002) *Computer Mediated Conferencing Guide*. Retrieved September 23, 2005 from <http://www.jiscinfonet.ac.uk/InfoKits/effective-use-of-VLEs/resources/itsn-computer-mediated-conferencing>
- [22] McLoughlin, C. & Oliver, R. (1998). Planning a telelearning environment to foster higher order thinking. *Distance Education*, 19(2) 242-256.
- [23] McLoughlin, C. & Panko, M. (2002). Multiple perspectives on the evaluation of online discussion. World Conference on Educational Multimedia, Hypermedia and Telecommunications (1), 1281-1286. Retrieved September 23, 2005 from <http://dl.aace.org>
- [24] NCODE - Flexible Learning Australasia. Retrieved September 23, 2005 from

<http://www.acode.edu.au>

- [25] Preece, J. (2000). *Online Communities: Designing Usability, Supporting Sociability*. Chichester: Wiley.
- [26] Ramsden, P. (1992). *Learning to teach in Higher Education*. London: Routledge.
- [27] Rogers, C. R. (1959). A theory of therapy, personality, and interpersonal relationship, as developed in the client-centred framework, in S. Koch (Ed.) *Psychology: A study of a science*, Vol. 3. Formulations of the person and the social context (pp184-256). New York: McGraw-Hill.
- [28] Rogers, C. R. (1962). The interpersonal relationship: the core of guidance,' in Stewart, J. (ed.) *Bridges Not Walls: A Book About Interpersonal Communication*, London, Addison-Wesley (1977), 240-248 (reprinted from *Harvard Educational Review* 32, Fall, 1962, 416-429).
- [29] Rourke, L., T. Anderson, et al. (2001). Methodological Issues in the Content Analysis of Computer Conference Transcripts. *International Journal of Artificial Intelligence in Education*, 12(1), 8-22.
- [30] Salmon, G. (2002). Mirror, mirror, on my screen...Exploring online reflections. *British Journal of Educational Technology*, 33(4), 379-391.
- [31] Schrire, S. (2005). Knowledge building in asynchronous discussions groups: Going beyond quantitative analysis. *Computers & Education*, In Press.
- [32] Warren, K.J, and Rada. R (1998). Sustaining computer-mediated communication in university courses. *Journal of Computer-Assisted Learning* 14(1), 71-80.
- [33] Wenger, E. (1998). *Communities of practice: Learning, meaning, and identity*. Cambridge, Cambridge University Press.
- [34] Woodman, M., Milankovic-Atkinson, M., Sadler, C., Murphy, A. (2001). From conventional to distance education: adopting a pedagogy and managing the transformation. *Teaching & Learning Online: Pedagogies for New Technologies*. J. Stephenson. London, Kogan Page Limited: 150-161.
- [35] Yin, R. K. (2003). *Case study research, design and methods* 3<sup>rd</sup> ed. London: Sage
- [36] Zimmer, B. and G. Alexander (1996). The Rogerian interface: for open, warm empathy in computer mediated collaborative learning. *Innovations in Education and Training International*, 33(1), 13-21.
- [37] Zimmer, B. and G. Alexander (2000). Using Carl Roger's communication principles to facilitate mutually supported learning online. OTiS Workshop.