

## **Gender differences in an on-line learning environment**

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**Abstract** This paper focuses upon the use of Computer Mediated Communication (CMC) in a specific learning context by a small community of postgraduate (MEd) distance learners and their tutors. Content analysis of on-line dialogues was used to investigate learning and socio-emotional behaviour within this community. The data presented suggests that men and women took distinctively different roles in the on-line learning environment. Most significantly, the cognitive and metacognitive (learning) content of on-line seminar contributions by men and women was found to be similar, but their social and interactive behaviour was significantly different. In particular, it was found that within a formal on-line learning environment men sent (on average) more messages than women; they wrote messages which were twice as long as those sent by women; and made more socio-emotional contributions than women. Women, however, were found to contribute more 'interactive' messages than men. This paper concludes that the application of CMC technology to a specific learning context may reproduce gender differences within a learning community.

*Keywords:* Computer-mediated communication; Gender differences; On-line learning

### **Introduction**

This paper explores gender differences and relations in a small mixed sex group of postgraduate distance learners working in an electronic learning (CMC) environment. CMC is becoming increasingly established as an important medium for teaching and learning in higher education (see, for example, Tolmie & Barbieri, 1997; Emms & McConnell, 1998; Harasim *et al.*, 1995). Hence there is a concomitant need for academics to understand how to manage this medium so that its learning potential may be optimised. The central aim of this paper is to examine and interpret the dialogues between men and women in a CMC environment, with a view to beginning to understand some of their differences and

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relations when engaged in a specific learning task. It is part of a project in which the main long term aim is to identify, and explore, the ways in which the potential of CMC may be used to critically develop social and academic interaction between students and tutors. Other recent studies (for example McConnell, 1997) have looked at interaction patterns between men and women in educational CMC (such as turn taking and directing conversation), gender related language use (Herring, 1993) and general behavioural, use and attitude differences (Yates, 1993). However, there have as yet been few attempts to examine men and women's dialogue in asynchronous CMC in relation to their learning (see Herring, 1996 for a discussion of the current state of this research).

The research described in this paper was conducted in the Division of Education at the University of Sheffield during 1995-96. An ethnographic rather than experimental approach has been taken given the small number of students in the on-line events being analysed. The project involved a group of 16 first-year MEd students and their tutors; this represents a ten per cent sample of the total 1995 entry group to the University of Sheffield MEd programme. The students were enrolled on MEd programmes in either Educational Studies or English Language Teaching; at the time of the project they had already studied a core foundation module and were beginning their first specialised module. All the students volunteered for the project and all were part of the Division's UK distance education programme (although, as well as the UK, students were based in Luxembourg, the Netherlands, Ireland, Germany and Finland). In common with many other distance learning centres, these students use mainly print-based materials, have only limited opportunities to meet their tutors or other students and are relatively isolated, academically and socially. The group of students included 11 women and five men.

In the study described no dedicated software or hardware was used; the students who participated in the project used their own desk-top computers to access an Internet e-mail account which was provided for them. Asynchronous computer conferencing facilities were provided by the Mailbase system at Newcastle University. This enabled both students and staff in the study to engage in computer conferences, retrieve readings from the server as well as access and search an archive containing the messages from all the discussions which took place during the project.

### **Methodology**

During the project, a range of data was gathered. This included:

- electronic diaries of the students' experiences of teaching and learning during the project;
- transcripts of all contributions made to the on-line discussions which took place during the project;
- a postal questionnaire administered to students at the end of the project;
- a transcript of an informal group interview conducted during a residential weekend at the end of the project.

Between June 1995 and March 1996 the project group took part in two on-line seminars, based on a reading (Anon, 1995), during September 1995 and an organised social gathering in October 1995, as well as conducting a range of informal on-line discussions. The first on-line event was an introductory activity during which the project group of 16 students and their personal tutors (eight) were asked to post a message to the list introducing themselves to the rest of the group. While tutors accessed the discussion list using workplace facilities, students installed a modem at home and logged on to their Internet account in order to send and receive their messages. Five students (four women and one man) failed to complete this process.

Of the 11 students who sent an introductory message to the discussion list, nine (five women and four men) actively participated in subsequent project events. In addition, a male student from a Finnish university joined the project group and four of the eight tutors (two male and two female) continued to be actively involved in the project. The active group therefore included seven women and seven men. A total of 270 messages was sent to the discussion list during the lifetime of the project and there was evidence of private e-mail correspondence between students and tutors. In some instances these were referred to in group discussions. An attempt was made to monitor the level of these communications through the electronic diaries kept by students. However, this proved difficult to maintain and therefore private communications were excluded from the study even though they may be part of the 'glue' of the public on-line discussions.

### **The on-line seminars**

The on-line seminars, which lasted two days, ran twice during a week. A 'Chairperson' and an introductory 'Speaker' were appointed for both events. The transcripts from both of the on-line seminars were analysed using coding categories developed by Henri (1992). These categories were used for two reasons. They were designed: firstly, to include significant aspects of discussion which were of particular interest to us (including both social and academic language indicators) and secondly, to be applied by teachers in on-line contexts rather than used by researchers as purely empirical research tools. It was felt that a demonstration of their utility would enable a step towards more routine analysis of on-line discourse as part of the teaching and learning process to be taken. Their use involved breaking down the contributions made by seminar participants into 'units of meaning' and allocating these to appropriate categories (Table 1).

The categories described by Table 1 were further subdivided for purposes of analysis into two codes for interaction (implicit and explicit); five codes for cognitive skill (elementary clarification; in-depth clarification; inference; judgement; strategies); three codes for metacognitive knowledge (person; task; strategies) and four codes for metacognitive skill (evaluation; planning; regulation; self-awareness). In addition, 'units of meaning' were analysed for surface and in-depth processing skills. Table 2 illustrates the percentages of contributions made to the seminar discussions in each of these categories.

**Table 1.** Summary of the analytical framework (after Henri, 1992)

Dimension	Definition	Examples of Indicators
Participative	Compilation of the number of messages or statements transmitted by one person or group	Number of messages Number of statements
Social	Statement or part of statement not related to formal content of subject matter	Self-introduction Verbal support 'I'm feeling great.....!'
Interactive	Chain of connected messages	'In response to Celine.....' 'As we said earlier.....'
Cognitive	Statements exhibiting knowledge and skills relating to learning processes	Asking questions Making inferences Formulating hypotheses
Metacognitive manner	Statements related to general knowledge and skills and showing awareness, self-control, and self-regulation of learning	Commenting on own of accomplishing a task Being aware of the emotional context of task completion

**Table 2.** Contributions to Seminars 1 and 2 by category (after Henri, 1992)

Analytical category	Contributions to Seminar 1	Contributions to Seminar 2
Social	22%	25%
Interactive	28%	31%
Cognitive skills (surface)	15%	12%
Cognitive skills (deep)	28%	28%
Metacognitive knowledge	3%	3%
Metacognitive skills	4%	1%

Analysis of transcript data from the on-line seminars suggested that the on-line learning community was distinctive in a number of ways. Firstly, the seminar discussions were characterised by significant amounts of social as well as academic exchange. This is described as 'socio-emotional', as opposed to 'task-oriented', discourse. Secondly, the seminar participants demonstrated high levels of 'interaction' with one another, typically by referring explicitly, and responding, to arguments put by previous contributors to the seminar. While this tended to 'slow down' the pace of the seminar, during the project evaluation students indicated that they had appreciated this opportunity to engage with the views of their peers. This aspect of on-line discourse is described 'listening'.

### Male and female participation

One of the early attractions of distance education was its presumed capacity to increase access and equity by removing some of the barriers to participation, such as attendance (George, 1995). CMC has also been advanced as a powerful yet neutral tool for enhancing distance education's capacity yet further in this

and related ways (Dubrovsky, *et al.*, 1991; Kiesler, 1992; Sproull & Kiesler, 1991; Weisband, 1992).

However, as Spears and Lea (1994) have argued extensively these are problematic issues. Yates (1997) summarises these arguments and suggests that, far from being free of the constraints of existing social relations, CMC interactions may reflect them. Furthermore, male and female students may show different preferred learning styles (Turkle & Papert 1990; Philbin *et al.*, 1995) which may extend to their use of information technologies such as CMC (Allen, 1995; Savicki *et al.*, 1996). Meadows and Watts (1996) in a survey of the use made of UK discussion lists by primary school teachers in the UK, found that over a two-month period on one discussion list (UK Schools discussion list) only five women, compared with 35 men, actively participated in discussion. Although, as the UK primary teaching profession is predominantly female, women might have been expected to represent the majority of users on such a list, female participation on this list was restricted to women who identified themselves as IT specialists.

Some significant differences in the access and participation of men and women students were noted in this research with distance learners. In terms of access, reference has already been made to the five students, four of whom were women, who failed to successfully 'get on-line'. In spite of a huge investment of tutor-time, it was not possible to help these students to use the project facilities and, clearly, this raises equity issues in terms of access to the learning environment. Amongst the group of students who did successfully access the project technology (five women and four men), differential participation rates were evident. For example over the lifetime of the project male students contributed, on average, slightly more messages than female students; 18.4 messages compared with 15.9.

**Table 3.** Male and female participation in the project

Event	Male students			Female students			Total messages
	number of students	messages sent	mean number of messages per student	number of students	messages sent	mean number of messages per student	
Project lifetime	5	92	18.4	7	111	15.9	203

However, male and female participation rates varied according to project events. Early in the project, men were more active than women (Fig. 1). though during the seminars both reached an identical peak. There were also differences between Seminars 1 and 2 in terms of male and female participation rates. In Seminar 1, the men sent, on average, more than twice as many messages as the women while, for Seminar 2, the mean number of messages per female student was slightly higher than for the males (Table 4). After the seminar, participation rates resumed their pre-seminar pattern, with men contributing more messages than women.

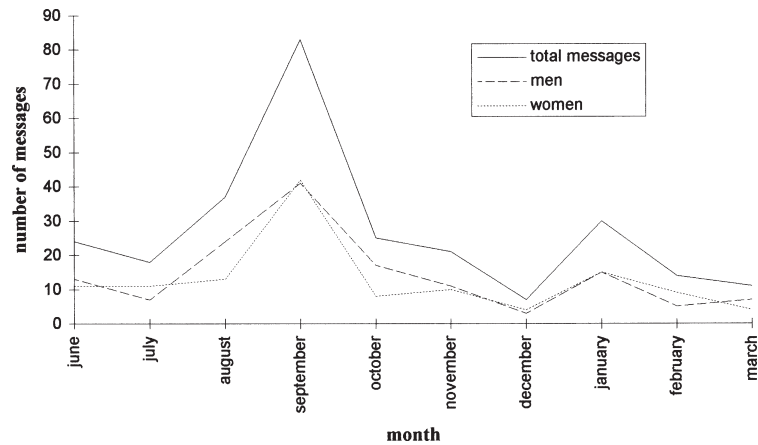


Fig. 1. Time of messages sent during the project

Table 4. Male and female participation in Seminars 1 and 2

Event	Male students			Female students			Total messages
	number of students	messages sent	mean number of messages per student	number of students	messages sent	mean number of messages per student	
Seminar 1	2	11	5.5	3	7	2.3	18
Seminar 2	3	9	3	4	16	4	25

One possible interpretation which was suggested by the general pattern of 'active' participation, outside the seminar events, is that the female students considered the nature and quality of their contributions more carefully than the men. Another possible interpretation is that they may also have engaged in more self-censorship, within the context of the 'public forum' (i.e. the discussion list) than the men. It can also be suggested that women's contributions to the on-line community tended to be more task-oriented than socio-emotional (i.e. the rate of participation declined outside of the structure of a formal seminar event) and, conversely, that the men made more socio-emotional contributions to the 'electronic community' than the women. Clearly these can be no more than conjectures in such a small group though these possibilities may be worthy of further investigation.

Men and women's participation rates within the seminar events (i.e. during September) were similar, suggesting an equal task-orientation in terms of gender. However, the difference in participation rates between Seminars 1 and 2 (with men contributing more in Seminar 1 and women more in Seminar 2) suggested that women may be hesitant about making early claims on electronic space.

The mean length of messages sent to the second on-line seminar by female students was 159 words. Messages sent by male students were, on average, more than twice as long (351 words). Similar findings have been reported by

Herring (1993) who described messages from women in 'conference' contexts to be typically shorter than those from men. This might suggest that the linguistic environment of the on-line seminar does not privilege women who may, in fact, be disadvantaged by the lack of non-verbal cues (for a more detailed explication of this argument see Herring, *op. cit.* and Yates, 1997).

### **Social and academic discourse in the on-line community**

It is tempting to view the relationship between social exchange, interactivity, cognitive skills and metacognitive skills/knowledge as essentially hierarchical, with social 'chat' located at the base of a pyramid which culminates in the 'higher order' skill of metacognitive thinking. Within such a framework it could be argued that very little 'progression' occurred during the seminar, either individually (i.e. within the individual messages sent by students) or chronologically (i.e. between messages 1 and 30).

In an electronic environment, however, the relationship between social, interactive, cognitive and metacognitive discourse and learning may be rather more complex. For example, the fact that discussion is taking place within a wholly linguistic environment (where non-verbal communication strategies are not available) appears to influence the way in which participants contribute (a number of studies have explored this theme; for example, Rice and Love, 1987). The messages posted to the seminar were frequently characterised by detailed explication of thinking and ideas, often through the presentation of a series of examples in order to illustrate a point. This may reflect the fact that it is not possible, in an on-line environment, for the 'speaker' to simultaneously monitor the reactions of others (e.g. a questioning glance to indicate the need for further explanation or the nodding of a head to indicate a point has been grasped). The effect of this is often that, for purposes of clarity, a particular cognitive skill (for example defining terms) is rehearsed in a number of different ways. While such discourse may preclude 'moving on' to deeper processing skills or to metacognitive skills, the clarity of discussion, and depth with which ideas are explained, may offer a valuable learning experience to students, in terms of exploring their own thinking and that of their colleagues. It is suggested that the distinctive environment of the on-line seminar, may support the two dimensions of on-line discourse — 'listening' and 'socio-emotionality' — that played such a critical role in the construction of this 'community' of distance learners. Analysis of the project data suggested, however, that men and women may take distinctively different roles in these on-line processes. Although the cognitive and metacognitive content of seminar contributions made by men (37 percent and four percent) and women (40 percent and five percent) was similar, the social and interactive on-line behaviour of male and female students was significantly different. As well as differences in the number and length of contributions made by men and women, the data analysis suggests significant differences in the social and interactive content of messages sent to the on-line seminar by men (33 percent for 'social' and 26 percent for 'interactive' discourse) and women (17 percent for 'social' and 38 percent for

'interactive' discourse). The following vignettes illustrate some of these trends (and in Phillippa's case a significant departure from them).

### **The on-line learners: four vignettes**

Brenda, a 43 year old first year MEd (Educational Studies) student, worked full-time as a primary teacher in Luxembourg. She was a very supportive, committed member of the group although later confessed to having been somewhat nervous about participating. She had no previous experience of using IT in the workplace and had only limited experience of using a word processor at home.

Brenda made her three contributions to Seminar 2 at regular intervals: the first one a third of the way into the discussion, the second one after two thirds of the total contributions had been made and a final message at the close of the event. Each of her contributions contained social exchange and reference to views expressed by other seminar participants.

Brenda's main input to the discussion, in terms of cognitive skills, was Message 11 (70 percent of which was judged to draw upon deep processing cognitive skills). This message was sent around the mid-point of the main seminar discussion (i.e. between Messages 6 and 18) and was sandwiched between messages which also drew primarily upon deep processing cognitive skills (numbers 9, 10 and 12). Brenda's entry into the seminar may be described as 'solid and safe'; she listened to other contributions before sending a message, joining in with an appropriately pitched input when discussion was at its peak.

Carl, a 36 year old first year MEd (Educational Studies) student, worked full-time as a mathematics and statistics lecturer at a German University. He was a confident member of the group, always willing to offer an opinion and instigate discussion. He volunteered to act as Chairperson during seminar one. Carl sent only slightly more messages (seven) to the first seminar than to seminar two.

In the first seminar, Carl's interest had been on the impact on adult learning of 'anxiety' and the contribution to adult education made by 'training'. He was actively involved in extending the discussion on anxiety during the early part of Seminar 2; Carl sent regular messages to seminar participants during the first part of the on-line event (numbers 4, 7 and 10). These messages contained a mixture of social/interactive discourse and deep processing cognitive skills.

However, as seminar discussion moved onto the impact of teaching on effective learning, Carl's participation waned. He made no further contributions to the active part of the discussion but sent a social/interactive message shortly after the discussion started to flag (Message 21) and towards the end of the seminar (Message 27). Carl's participation in Seminar 2 may be understood as closely-focused and issue-oriented.

Phillippa, a 42 year old first year MEd (English Language Teaching) student, worked part-time as a Timetable Officer in a Business School in the south of England. She had worked in computing for 24 years in software and systems development and was very competent with the project technology. An extremely active participant in the group, she appeared confident and assertive, playing a



central role in many of the project discussions. She volunteered to act as 'opening speaker' in Seminar 2.

Phillippa was the most active participant in Seminar 2 in terms of the number and length of contributions made to the discussion. Untypically, within the group, her messages rarely contained social greetings and usually got straight to the point. She almost always acknowledged other participants; she was, in fact, meticulous about examining and responding to the points made by others.

The bulk of Phillippa's messages were usually categorised as drawing upon cognitive skills (surface processing). However, in her role as 'opening speaker' for the seminar she posted a message to the list (number 3) which drew upon a wide range of skills (social, interactive and cognitive), including deep processing cognitive skills. Clearly this message, as the initial stimulus for the seminar discussion, was of critical importance.

After Message 18 of the seminar, few contributions to the seminar drew upon cognitive skills. A notable exception to this is a message (number 25), sent by Phillippa, which drew upon deep processing cognitive skills and metacognitive knowledge and skills; this was the only message (in either seminar) which was judged to draw upon metacognitive skills and one of only three messages which drew upon metacognitive knowledge. The message was sandwiched between two messages which had also been contributed by Phillippa but which were quite different in terms of content and style (being exclusively interactive and, unusually for Phillippa, social).

It may be conjectured, from Message 25, that Phillippa's metacognitive contribution to the seminar happened almost in a vacuum, relatively isolated from the experience of her peers. However, it could equally be the case that the ideas which were being expressed in Messages 6-18 (i.e. during the main body of the seminar) were being processed by Phillippa for some time after, i.e. as late as Message 25. Because asynchronous communication allows this time for reflection, it may permit individuals to continue working with an idea in private before pursuing it further in public. The traditional face-to-face seminar may not as easily allow such 'revisiting' of ideas.

The data also suggests that Phillippa, like many other students, needs time and space for reflection in order to develop her ideas. It is noticeable that the messages where she makes an input which draw on deep processing cognitive skills (numbers 16 and 25) are directly preceded by messages which were also sent by her. This suggests that she makes consecutive, but different, attempts to articulate a position or to clarify her thoughts — a luxury which is not always possible in a face-to-face seminar format.

Henry, a 30 year old first year MEd (Educational Studies) student, worked full-time as a Geography teacher at a secondary school in the south of England. He had used a PC in the workplace for three years but had no previous experience of on-line communications. He was very enthusiastic about the potential of on-line learning and played an active, and very sociable, part in the project discussions.

Henry entered the seminar discussion late (Message 17) and contributed two consecutive messages which mark the end of the active period of the seminar discussion. He also posted a social/interactive message at the end of the semi-

nar event. Henry's consecutive messages referred to arguments previously put by seminar participants but then re-focused discussion on the original seminar text. In a lengthy, detailed message, Henry applied the framework for 'technological anxiety' offered by the seminar text to an environment with which he was familiar — his own workplace — drawing upon small scale surveys of staff which he had previously conducted.

Although Henry expressed some anxiety that his contribution may be considered 'too anecdotal', an analysis of his contribution to the seminar discussion suggested that it was one of the few messages which had demonstrated metacognitive knowledge as well as cognitive skills. The profile of his contributions to the discussion list is, in fact, one of the most varied in terms of the nature and style of his messages. Table 5 summarises the contributions, by category, of these four students.

**Table 5.** Contributions of students to Seminar 2 by analytical category

Analytical category	Brenda's Contributions	Carl's Contributions	Phillippa's Contributions	Henry's Contributions
Social	26%	35%	13%	27%
Interactive	37%	26%	37%	27%
Cognitive skills (surface)	11%	0%	31%	5%
Cognitive skills (deep)	26%	39%	13%	32%
Metacognitive knowledge	0%	0%	3%	9%
Metacognitive skills	0%	0%	3%	0%

Messages from male students demonstrated, on average, twice as much social exchange as those from women. Again, this might suggest that the male students are less concerned than the females about filtering out or 'self censoring' their general social comments within the formal context of the seminar. For example, early in Seminar 2 Carl commented:

Good evening. Just got in and it's 22.30 here. I read your comments with interest (referring to two other participants); want to comment, but hope it will wait 'till tomorrow a.m. Pat's Sunday sentiments about a beer seem even more appropriate today. Will post my comments tomorrow a.m. Sleep well!

And from Henry:

Hi everyone, good to see so much discussion earlier today and over the last weekend. Am I doing something wrong? I seem to be the only one who hasn't made it to the pub in the last couple of days - roll on Saturday night!

Brenda's social contributions were typically much more succinct:

Hi everyone - sorry no contributions from me 'til now but only arrived home last night.

Phillipa tended to avoid social contributions altogether and would usually preface her messages with a copy of that part of the previous message to which she was replying.

One reading of the data on on-line social exchange is that men in the group gossiped and exchanged social pleasantries in the electronic environment whereas the women tended to be task-oriented. It would, however, be unwise to assume from this that it is only the men who contributed to the socio-emotionality of our electronic community. Earlier in this paper it was suggested that listening skills play an important role in building the on-line community.

Such listening is located, in terms of data analysis, by Henri's categories 'implicit and explicit interaction'. The analysis of interactive behaviour among the students in this study suggests that women acknowledged the contributions made by other students significantly more, during Seminar 2, than the men; the mean level of interactive contributions by women was 38 per cent, compared to only 26 per cent for men. These data may suggest that the female students were taking more 'care' than the men to incorporate information and ideas from previous messages in their replies; in effect they were listening more carefully than their male colleagues to what was being said.

In another study, Myburgh (1994) investigated women's participation in five 'gender neutral' discussion lists. Although the participation rates identified by Myburgh were similar, in terms of male and female participation, to those identified in the discussion list described here, Myburgh did not find significant differences in terms of the nature of contributions made by men and women.

### **Student reflections on relationships**

During the lifetime of the project reported in this paper, it was not apparent that gender would be of interest in the research or indeed to the participating students. It was in the course of data analysis, some time after the project had ended, that the issues reported in this paper were identified. By that time a new on-line teaching and learning project, involving a group of 24 first-year MEd and EdD students, was in progress. Four students from our previous on-line learning project (i.e. from the group involved in the research reported here) were asked to join this new project group as mentors. These students were now in the second year of their distance learning MEd course.

Because, during the project, gender issues were not expected to become a focus of the research, it was interesting to get an initial reaction to this possibility from on-line learners (albeit from a different group of learners to those who had been involved in the project). The new group of students were asked, via a general question to the project discussion list, whether they thought that gender issues may be relevant within an on-line environment.

Initially the question did not stimulate much discussion and those messages which were received came, with only one exception, from students who had been members of the original project group (and who were now acting as mentors). All the messages suggested that gender was not considered important by on-line learners. It was only when the students were provided with the category and participation analyses, showing apparent differences in social style, that a much more extensive debate of these issues ensued among them.

### **Conclusion**

The data gathered in this project have indicated that the use of CMC had provided distance learning students with additional opportunities for dialogue with tutors and peers. Students reported, through the project evaluation questionnaire, that their involvement in the project had helped to reduce their sense

of social isolation and had made them feel part of a 'community' of learners (Moore, 1980; 1991).

Although some of the students in this, and a subsequent, project reported that they were unaware of gender-typed behaviour, the transcript analysis of project events suggest that men and women behaved differently in the on-line learning environment in terms of the frequency, length and style of their contributions to group discussions. In particular, it was observed that men's contributions to discussions were, typically, more numerous and longer than those of women, and that the contributions made by men tended to include greater levels of social exchange than those of women. Women, however, appeared, typically, to be more interactive than men, i.e. their messages included implicit or explicit references to previous contributions.

Various possible explanations have been suggested for the different behaviour of men and women in the on-line context including: the impact of the public forum on male/female discourse and the impact of the absence of non-verbal cues on male/female discourse. The on-line learners with whom the data generated by this project was shared — including some who had participated in the events described in this paper — offered further reflections on the differences in male and female behaviour described here; a number of these focused upon the nature of male and female social relations.

This research suggests that, although CMC technology may be an effective way of building and supporting a community of postgraduate on-line learners, relations within such an environment may be significantly influenced by gender. These suggestions will be pursued with further research in order to develop teaching and learning strategies which help to optimise the opportunities for both men and women in mixed sex on-line learning communities.

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