Differential Participation of Males and Females in a Computer-Mediated Communication Course*

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Abstract

The narrow bandwidth of computer-mediated communication (CMC) courses reduces status differences, suggesting that men and women will participate equally in course activities. In contrast, gender differences in computing skill, attitude, experience, and family support for students' CMC activities suggest that females will have lower levels of participation. A study of interactions among 15

Résumé

La largeur de bande étroite des cours de communication par ordinateur (CPO) réduit les différences de standing et par cela suggère que les hommes et les femmes participeront également dans les activités de cours. Par contraste, les différences entre les sexes par rapport aux abilités en informatique, attitudes, expériences et soutien familiale des activités des étudiants CPO suggèrent que les

students enrolled in a graduate course in education found no instances of sexist language or overt exclusionary behaviour. However, women exercised less procedural leadership, had reduced influence on group products, contributed less to the advancement of their group's argument, and overall had fewer productive contributions.

femmes auront des niveaux moins élevés de participation. Une étude des interactions parmi les étudiants inscrits dans un cours de pédagogie du second cycle universitaire n'a trouvé aucune instance de langage sexiste ni de comportement manifestement limitatif. Cependant, les femmes ont exercé moins de leadership procédural, avaient une moindre influence sur les produits du groupe et dans l'ensemble, elles y faisaient moins de contributions productives.

Many universities have endorsed computer-mediated communication (CMC) as an effective mode of delivery for teaching students at a distance. CMC courses are cost-effective for universities (compared to audio and video technologies), if the costs of hardware, software, and service providers to connect to the hub are borne by students. CMC courses are also recommended because they promote greater interaction between students and their instructor and among students than is the case in correspondence courses. High levels of interactivity are associated with student satisfaction and learning in distance education (e.g., Fulford & Zhang, 1993) and in face-to-face classes (e.g., Cohen, 1994). Not only is there more interaction in CMC courses but it is more equally distributed among course participants. For example, there is good evidence that teachers share the stage to a much greater extent than in face-to-face courses. We know much less about the participation of men and women. Consistent gender differences have been reported in computer attitudes, experience, and skill. But do these differences result in differential participation (in quantity and quality) of men and women in CMC courses? This article reports a study that examined the question in a small sample of graduate students.

Theoretical Framework

Previous studies of small group deliberations in face-to-face settings have consistently found that males participate more extensively than females and have greater influence on group decisions (Wood, 1987). The effect of gender is moderated by group composition. The dominance of males is most likely to occur in groups in which females are a minority (Holden, 1993; Lee, 1993).

Male dominance is assumed to be lower in CMC courses because the influence of dominant individuals is reduced when social identifiers (race, age, career prestige, gender) and nonverbal behaviours that signify rank are removed (Kiesler, Siegel, & McGuire, 1984; Selfe & Meyer, 1991). In addition CMC permits multiple conversations, in contrast with face-to-face courses in which only a single person can speak at any one time, providing more opportunities for women to talk (McConnell, 1994). There is evidence that teachers and students participate more equally in CMC than in face-to-face courses (Harasim, 1987; Hiltz, 1994; Wells, 1993), but researchers have not examined whether there is gender equity.[1]

Some feminists argue that CMC and more generally the Internet provide opportunities for female assertiveness, resistance to male oppression, and playful gender bending. For example, Spender (1995) proposes that patriarchal male literature be re-written at women's web sites "to have Ophelia come back from her watery grave and give more than a piece of her mind to Hamlet" (p. 64). A number of web sites have sprung up to foster women in cyberspace by providing sites for feminist topics (e.g., Feminist Activist Resources on the Web: http://www.igc.apc.org/women/feminist.html) and special technical support (e.g., WWW Women Web Ring: HYPERLINK http://lucien.SIMS.Berkeley.EDU/women_in_it.html) for women seeking to get online.

Despite these efforts to create space on the Internet for women, demographic data on Internet use indicate that women are underrepresented, although there is some evidence that the gender gap is decreasing (Shade, 1996a). The hypothesis that CMC delivery of a course will lead to equal participation by both genders is challenged by studies reporting gender differences in computer attitudes, skill, and use. Women have higher levels of computer anxiety and less confidence in their ability to perform tasks that require computer skills (Colley, Gale, & Harris, 1994; Farina, Arce, Sobral, & Carames, 1991; Gattiker & Hlavka, 1991; Okebukola, 1993; Rosen & Weil, 1995; Shashaani, 1994). Significant numbers of women

believe that computing is unfeminine (Durndell & Lightbody, 1993; Grint, 1989), a belief that contributes to depressed confidence and heightened anxiety (Colley et al., 1994). Many women have weaker computer skills, especially on complex tasks (Busch, 1995). Even female managers may feel disempowered by male technicians (Steeples et al., 1996). Women have less experience in computing than men on entry to course work, a factor that negatively impacts on their achievement (Taylor & Mounfield, 1994; Todman & Monaghan, 1994). Some studies (e.g., Dyck & Smither, 1994) found that when prior computing experience is controlled, gender differences in performance and attitude disappear.

Two other factors might limit gender equity: women receive less family support than men for CMC course activities; women are more likely to report concern from other family members that their course participation is tying up the family computer and telephone line (Eastmond, 1995; Grint, 1989; Kirkwood & Kirkup, 1991). There is also evidence of attempts by males to exclude females from certain areas of CMC course activity such as technology tutorials (Kirkwood & Kirkup, 1991) and the use of exclusionary language (McConnell, 1994).

Studies of gender differences in computer attitudes, skill, experience, and support raise the question of whether there is a gender levelling effect in CMC courses as would be expected by the narrow bandwidth and multiple conversations' arguments. A graduate course that required high levels of interaction among students provided an opportunity to test the null hypothesis that men and women participate equally in CMC courses. We anticipated (initially) that there would be little difference between men and women in participation rates and control. When we found quantitative evidence of differences we began to search for qualitative evidence of factors that might impede female participation, such as differential technical skill, content knowledge, and sexual harassment. We also searched for other kinds of gender differences in student communications.

Method

Sample

Fifteen graduate students, all practising teachers, enrolled in a CMC course on cooperative learning. Eleven of the 15 were women. Four were doctoral students (1 male and 3 females); the remainder were working towards a master's degree. In the first three weeks and the last two weeks of the

course, students interacted with the instructor and the rest of the class on an individual basis. During the intervening seven-week period, they worked in self-selected, unsupervised groups of 3–4 on group projects which they presented to the conference.

Sources of Data and Procedures

Messages exchanged by students within their groups (N=673) and the products of each group (N=40) were entered into ATLAS/ti (Muhr, 1995), a qualitative data analysis program. The software enables users to create codes *in vivo*, assign codes to text, and group codes in networks. It also creates SPSS files for quantitative analysis.

The first phase was a quantitative study of gender differences in participation and control. Five indicators were used to code student messages and final group products. The mean frequencies and mean quotation lengths for each code were calculated and the results compared for men and women. Differences between the two groups were expressed as effect sizes (the means for the women were subtracted from the means for the men and divided by the pooled standard deviation).[2] The five indicators were:

(i) **Procedural leadership** moves were messages in which students issued directives to other group members, for example, by assigning tasks to complete group projects.

(ii) **Influence on final products** consisted of suggestions made in group discussions that were included in the final text submitted to the conference. The final group products were first coded in terms of the ideas they contained. Messages circulated within the group were then searched to identify who suggested each of the ideas that were included in the group submissions. Credit was given only to the first person who raised a given idea, even if other group members repeated it in subsequent messages.

(iii) **Unused contributions** were ideas that did not appear in the final texts. In most instances these were not explicitly rejected by other group members, but simply faded away as groups re-worked their drafts.

(iv) **Constructive arguments** consisted of parts of messages that advanced the argument of the group, regardless of whether the idea being discussed in the message made it into the final texts. Four levels of argument were distinguished in the coding, but

because the frequencies were low, the levels were added to create a single score. The levels (adapted from Woodruff, 1995) were: messages expressing unelaborated agreement or disagreement with a proposition being considered by the group; elaborations of a proposed idea by suggesting ways to test it; identifying misconceptions by noting discrepancies between a proposed idea and conventional belief; and presenting contrary evidence against an idea being considered by the group. (These categories are described in greater detail and illustrated in Ross, 1996.)

(v) **All productive contributions** consisted of the sum of the other categories. (This category was slightly less than the total of the preceding because some passages were given more than one code.)

The second phase of the study was a qualitative search for instances of exclusionary behaviour, overtly sexist language, and male attempts to exclude women from participation. We also looked for references to family issues that might limit female participation in the course. In this phase of the analysis we were not concerned with the frequency or length of instances but with their richness.

Results

The quantitative analysis produced striking gender differences. The results were the same regardless of whether the indicators were reported as frequencies of codes (not shown) or as mean lines of text (displayed in Table 1). Table 1 shows that men and women did not participate in the course equally. Men were more likely to (i) take responsibility for the coordination of group activities by assigning tasks to members, (ii) make suggestions in the group discussions that were included in the final texts submitted to the conference, and (iv) offer arguments that advanced the deliberations of the group. The only category in which there were no gender differences was (iii) unused contributions. Even though women made fewer (v) contributions overall, they were just as likely as men to have their ideas excluded from the final group products. These data indicate that women had less influence than men in group interactions and the final products.

The differential participation of men and women might have been the result of gender differences in pre-existing factors that affect CMC participation. For example, students with weaker computer skills might contribute less than those with stronger CMC skills because of difficulty in accessing the conference. They might have less influence on group

Table 1.
Participation of Males and Females: Means, Standard Deviations, and Effect Sizes.

Code	Males (n=4)		Females (n=11)		Effect Size
	Mean	SD	Mean	SD	
Procedural leadership	87.25	84.86	40.55	30.15	-1.55
Influence on final products	431.75	304.05	332.91	148.76	-.66
Unused contributions	112.25	102.52	110.18	106.71	-.02
All constructive arguments	80.75	115.96	62.91	50.00-	-.36
All productive contributions	691.25	463.56	535.64	242.01	-.64

deliberations if their messages were delayed or arrived garbled. Prior knowledge of course content could also be a factor. Students with greater theoretical knowledge and classroom experience could be expected to have greater influence than students with less knowledge. If differences in CMC skills and curricular knowledge were confounded with gender, it might explain gender differences in participation.

To test this possibility, a research assistant not familiar with the hypotheses of the study ranked students' computer-mediated communication skills within groups, assigning first rank to the most able, second rank to the next most able, etc. The research assistant re-ranked students within groups based on their prior knowledge of cooperative learning (the content of the course). The course instructor independently ranked all students using the same procedures. Two minor discrepancies were resolved through discussion. Rankings were based on evidence generated prior to the start of the small group activities:

- Student descriptions of their teaching backgrounds and previous exposure to cooperative learning, the hardware and software they were using, and self-ratings of their proficiency and confidence in CMC skills on entry to the course.
- Student messages sent to a conference branch dedicated to sharing technical problems and solutions.
- Records compiled by a CMC coach hired to help students through technical problems.
- Student messages sent prior to the start of the small groups to the main conference and to a personal chat branch.

There were virtually no gender differences on either measure; the effect sizes were near zero (ES=.08 in both cases). In addition males reported as many technical problems in contributing to their groups as females (male M=35.75, female M=35.36, ES=-.06). The gender differences in participation could not be explained by technical skills or by course content knowledge.

We searched the data for other factors that might distinguish men from women. We searched with particular care for evidence of harassment, defined by Bell and de la Rue (1995) as open hostility or harassment (sexual or not), since this has been suggested as a substantial impediment to female participation in CMC (Shade, 1996b). We found no instances of chauvinistic language or overt attempts by males to exclude women from any course activities.

McConnell (1994) reported that females expressed concern about the language used by males in CMC courses, that it was too precise and technical, as opposed to the chatty talk of females. Although we did not attempt to categorize the language of men and women in terms of these subtler indicators, there was nothing in the database that suggested that female participation was limited by exclusionary male talk. However, there were several instances of women talking among themselves about gender issues that they chose not to share with the whole conference. In one instance a male wrote a reflection expressing his concern about an instance of inappropriate sexual touching that occurred in one of his high school classes. Helen (all student names are pseudonyms) commented on the incident to members of her all-female group ("God bless the girls who called sexual harassment for what it was"), but she did not share the comment beyond her group. Helen also wrote a feminist critique of the theoretical origins of one approach to cooperative learning (here, Method A) to support her own approach (here, Method B). This critique did not appear in the group's public response to Method A.

> I have a gut feeling about including The Old Boys Club in the theory of Method A… haven't sent in this reflection but it sure is begging to be sent. What say you, too antagonistic for the male bastion or is it time to be said?… Educate the masses—the boys to be productive men, girls to be reproductive women… Scientific methods perfected by Charles Darwin and supported by John Dewey, proved that females, because they had smaller brains were incapable of higher education; and because of their anatomy needed rest time, not study, during menses lest they harm their reproductive organs… When Dewey calls for teachers to be aware of capacities, needs and past experiences of those under instruction, he represents gender biased differences. [Method B] includes all children and adults equally.

There were relatively few references to family issues in the database. Females were eight times more likely to refer to their families (male M=1.00, female M=7.91, ES=.79). There were gender differences in how family issues were reported to affect participation in group activities. For example, two women, but no men, reported that they had been unable to log on earlier in the evening because their children were using the family computer for homework. Nancy persuaded her group to abandon a planned teleconference because she was experiencing difficulties balancing work commitments, family duties, and course obligations: "[child] still sick! What a drag — both myself and hubby sick this wkend with flu as well… I am

feeling a little swamped with course, work and life in general!… gotta go—kids screaming upstairs." If men were experiencing similar problems, they did not talk about them.

Gender contrasts were especially noticeable when two groups with different gender compositions were compared: one group had two men and one woman and the other consisted of four women.

Irene, the sole woman in her group, frequently referred to her family and how it affected her activities. She often ended her messages with reference to them:

> "I've got a squirmy baby in my lap. I will definitely have to check in later tonight."
>
> "My oldest son is asleep on the floor beside me; is my family trying to tell me something?"
>
> "Will make the short adjustment to my last part of research, but got a wee tired boy to get to bed RIGHTNOW!!!"
>
> "BABY IS NOT ASLEEP YET! That sums up the last hour for me so far."

Neither of the men responded to these messages. Midway through the group-work section of the course, Irene began to share some health concerns:

> "I can tell the holiday is over, my kids have just come down with a flu bug."
>
> "My kids are ill and my husband is stricken as well. With everybody up coughing all night and a baby who only wants to be rocked all day, my usually disciplined self is disappearing fast."

Still no response from the men. Irene's situation deteriorated further.

> I don't mind doing the edit but should inform you of what is happening here. My oldest son has a temperature of 104 and when I just took his pulse, it was so rapid I could barely count it. Just talked to a nurse and if it isn't down in the next hour, I am going to take him to emergency. What time I get back could be a problem so couldn't guarantee when I would send in our remarks—maybe not until tomorrow night. At this point, I am more worried about my little guy.

George responded about an hour later: "Irene, forget it! Deal with sick child," adding the next day, "Irene, hope all is well with kinder?" Jim also responded, two weeks later, "Irene hope your children shack the Flu bugs."

These were the only references the two men made to Irene's family concerns and they said nothing about their own families. Irene was grateful that George volunteered to do the edit for her ("Thanks for the understanding!") and continued to keep them informed of developments: "I took today off to play nursemaid. My son still has a fever but at least it's not as high, so hopefully all will be well soon."

In contrast, the group with four women regularly exchanged information about their families—driving a child to the bus station, romantic weekends with a spouse, assembling furniture with a son, and other home concerns. When Jane announced that her son's team had won a hockey tournament, the other three members of the group immediately responded (e.g., "Congrats Jane. That must have been really exciting for him and you!"). When Nancy reported that her daughter had the flu ("My little one is sick! Just got her down and hopes she stays there"), the others expressed sympathy. When Nancy later congratulated Helen on how much work she had done on one of the group assignments, Helen's reply acknowledged how difficult the past week had been for Nancy. "Why I have time to key? No Kids with Kroup & Koffs! Don't know how you juggle all the balls in the air. Wow! I'm impressed."

In the other two groups, each composed of one man and three women, family issues were also discussed. For example, in one group the three women exchanged personal experiences about whether it was a good idea to drive to Florida for the March Break in a mini-van full of kids. Neither of the men participated in these discussions about family issues.

Discussion

Women participated in group discussions to a lesser degree than men and had less influence on group deliberations. Gender was almost as strong a predictor of participation as prior knowledge of course content. For all productive contributions the effect sizes were -.63 for gender (males had greater participation) and 1.05 for prior knowledge (students knowledgeable about cooperative learning had greater participation).[3] The salience of gender might be partly attributable to the decision of most students to give themselves a "first name.last name" identifier which revealed their gender. However, all the nonverbal behaviours that signal status were concealed and multiple conversations occurred simultaneously, factors that are expected to reduce gender differences (Kiesler et al., 1984; McConnell, 1994; Selfe & Meyer, 1991). Gender differences in participation

were not explained by level of graduate program, computer-mediated communication skills, or prior knowledge of course content because men and women did not differ on these variables.

No instances of overtly exclusionary behaviour on the part of males were observed. This finding may not generalize beyond the sample. Females constituted a large, articulate majority in the class. Males who harboured sexist views may have withheld them in recognition that vigorous and effective responses would be quickly forthcoming. All students were teachers, members of a largely female occupation in which professional norms discourage chauvinistic behaviour (without entirely eliminating it). Different results might arise in a physics or computer science course, disciplines in which gender-equity norms are less well-developed.

The study also found gender differences in the extent to which family issues affected participation. Women were more likely than men to talk about their families and to describe instances in which family commitments impinged upon contributions to group efforts. The most interesting finding was the role of group composition in moderating the influence of family concerns. When women are in the majority, discussion of family issues may bring the group together, giving women a stronger sense of group inclusion, a process that may not occur when a single female is in a male group. Our findings about the effects of family on participation are limited by the fact that we collected no data on family composition and did not ask students directly about the role of family on their participation. Nor did we ask them to share their thoughts and feelings about other members of their group who were sharing family concerns.

The finding that men and women participated unequally in the course matters because there is evidence that unequal participation in complex, face-to-face learning tasks leads to wide variation in achievement (e.g., Cohen, Lotan, & Leechor, 1989). It is reasonable to anticipate similar outcomes in CMC courses. But what can instructors do to promote gender equity in CMC participation? The findings from this study suggest several strategies might be helpful.

1. Consider gender composition when creating groups. Studies of face-to-face instruction indicate that gender-unbalanced groups can be dysfunctional. For example, Webb (1984) found that in groups containing a single female the males tended to ignore her; in groups containing a single male, the females gave more attention to him than to other group members. We did not find any overt evidence to suggest that females (or males) were alienated

from their group, but we did observe differences in how family issues were treated in all-female and mostly male groups. Single sex or half male/half female groups may be more appropriate.

2. Reduce participation extremes. In this study, the standard deviations were large in all categories. Instructors might consult the status log (if the conferencing system has one) and use private E-mail to encourage and dampen participation by individuals. Tagg and Dickinson (1995) found that the frequency of student messages was higher for tutors who encouraged participation than for tutors who did not, even when number of tutor messages and promptness of tutor response were controlled. General policies about frequency and length of messages are likely to be helpful, although no study has examined the effects of such policies on gender differences in participation.
3. Assign rotating roles to students (such as editor, leader, evaluator, etc.). The division of labour that arises in the absence of instructor intervention can exclude lower-status groups from the most productive learning tasks (Anderson, 1994). Roles that circulate within the group might reduce the problem. Instructors need to tread a fine line: micromanaging the groups by imposing too much structure depresses student interaction (Ross & Raphael, 1990).
4. Instructors might develop CMC adaptations of strategies developed in a face-to-face setting to deal with differential participation. For example, Cohen's (1994) strategy of making a lower-status student a group expert could be adapted to CMC by providing a female student with privileged access to information or skills needed by her group.

Although this study found no evidence of harassment, it makes sense to disseminate guidelines that prohibit sexist language and exclusionary behaviour and monitor implementation. Virtually all universities have such guidelines, but students enrolled in distance programs may be unaware of their importance. Rohfeld and Hiemstra (1995) suggest that courses have a section on "tone" and that authors of messages that contain inappropriate language or references be directed to it.

One of the most persuasive rationales for CMC modes of delivering education to students at a distance is that the narrow bandwidth diminishes status differences, reducing the dominance of higher-status individuals. This study found evidence that gender inequities in course participation

persist. What we need is a better understanding of the underlying social processes that contribute to this persistence, an understanding that is beginning to develop in face-to-face settings but has yet to be investigated in CMC courses. A few studies are beginning to examine the impact of the CMC medium on student-student interactions. These interpretist studies interview students and analyze conference proceedings to understand the learner perspective. For example, Burge (1994) found that graduate students in CMC courses drew upon their peers for academic and affective support—and did not always get it. We also need to implement strategies for reducing inequality and measure their impact. Distance educators began with a powerful desire to equalize opportunity for students disadvantaged by geography. We need to extend the quest by equalizing opportunity for students disadvantaged by gender-related characteristics.

End Notes

1. In this article male dominance is defined as males communicating more frequently and for greater duration in small group interactions than females and exercising greater control than females over the agenda of the discussion and decision-making. Gender equity refers to equality between males and females in communication frequency, duration, and control. Gender levelling is defined as the tendency of CMC courses to reduce gender differences in communication that occur in face-to-face courses.
2. None of the comparisons reported in this article are statistically significant. Thompson (1993, 1997) argues that effect sizes are a more appropriate way to report findings than p values because p is so dependent upon sample size, a view supported in this article. In contrast, Robinson and Levin (1997) argue that researchers should calculate effect sizes only after establishing that a statistically significant difference exists. In interpreting these effect sizes it is helpful to keep Cohen's (1988) guidelines in mind: an effect size of .2 to .5 is small (all arguments), .5 to .8 is medium (influence on group product and all productive contributions), and .8 is large (procedural leadership).
3. The effects of prior knowledge of course content and computer-mediated communication skills on student participation in CMC courses are reported in Ross, 1996.

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Biography

John Ross is Professor of Curriculum, Teaching, and Learning at the Ontario Institute for Studies in Education (University of Toronto). He is also the Head of the university's field centre in Peterborough. His research interests are student evaluation, instructional innovation, and distance education.

John Ross est professeur de programmes d'études, d'enseignement et d'apprentissage à l'Institut d'études pédagogiques de l'Ontario (The University of Toronto). Il est aussi le directeur du Centre universitaire de Stages pratiques pour Étudiants à Peterborough. Ses intérêts de recherche sont en évaluation de l'étudiant, en innovation pédagogique et en formation à distance.