



## Skills required for participating in CMC courses: An empirical study

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### Abstract

The development of new communication technologies and their applications has opened a broad spectrum of options to promote learning, of which a significant one is CMC – Computer-Mediated Communication. Yet, students use this medium to a relatively small extent. Our premise is that the use of these technologies depends on the level of skills and expertise of the individuals using them. The purpose of this study is to determine whether taking a Computer Literacy and Applications course (CLA) before taking CMC courses has an impact on students' participation in CMC courses and on the effective use of various CMC tools. The sample consisted of 153 students enrolled in CMC courses in the Social Sciences in the Spring 2001/2 and Fall 2002/3 semesters. Participants were divided into two groups: 80 students who had taken CLA, and 73 students who had not. A questionnaire to assess the impact of CLA on participation in CMC courses was administered to the two groups. The results of the study indicate that participation in CMC courses is more intensive in the group that had taken CLA. Based on these findings, we recommend mandating a CLA course, like the one developed at the Open University of Israel (OUI), before taking CMC courses.

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*Keywords:* Computer-Mediated Communication; Distance education and telelearning; Interactive learning environments

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### 1. Introduction

The development of new communication technologies and their applications has opened a broad spectrum of options for promoting learning, of which a significant one is CMC –

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Computer-Mediated Communication. CMC is a combination of telecommunication technologies and computer networks (Berge & Collins, 1995; Ryan, Scott, Freeman, & Patel, 2000) that enable users to transmit, store, and receive information (December, 1996; Jonassen, Davidson, Collins, Campbell, & Haag, 1995; Lewis, Whitaker, & Julian, 1995; Paulsen, 1995) via synchronous and asynchronous communication tools (Ryan et al., 2000).

The potential of CMC as a teaching and learning medium has been widely examined and discussed (e.g., Bates, 1995; Berge & Collins, 1995; Bork, 2001; Harasim, 1990; Hathorn & Ingram, 2002; Hirumi, 2002; Kaye, 1992; Maddux & Johnson, 2001; Mason & Kaye, 1989; McConnell, 1994; Muirhead & Juwah, 2004; Pahl, 2003; Rekkedal, 1992; Rovai, 2002; Wolfe, 2001). There appears to be a common presumption that this medium improves the effectiveness of distance learning. In higher education, most of the CMC tools are applied through course websites. Selim (2003) examined the major factors that affect student acceptance of course websites and found that perceived usefulness and perceived ease of use are the key determinants of their acceptance and their assessment as effective and efficient learning tools. Integration of CMC into the teaching-learning process in higher education and its effectiveness has become a primary focus of educational research in recent years (e.g., English & Yazdani, 1999; Harasim, 2000; Mason & Bacsich, 1998; Nachmias, Mioduser, Oren, & Ram, 2000; Pena-Shaff & Nicholls, 2004; Selim, 2003; Tolmie & Boyle, 2000). Most research findings indicate that CMC provides a valuable addition to the process of teaching and learning, from pedagogical and social aspects. CMC supports various types of interactions: student-student, student-instructor, student-content, and student-interface (Hirumi, 2002; Rovai, 2002), which are critical in underpinning the learning process (Muirhead & Juwah, 2004), and thus provides opportunities for improved and more active learning. Strijbos, Martens, and Jochems (2004) propose a multifaceted process-oriented approach to computer-supported group-based learning (CSGBL) that focuses on critical elements that affect the emergence of preferred interactions.

For several years, the Open University of Israel (OUI) has been integrating CMC technologies into its course websites to improve its distance teaching (Erlich, Gal-Ezer, & Lupo, 2002; Friedman & Beller, 1997). The OUI, a distance education institution, offers academic studies to students throughout Israel and abroad. The multiple features of distance education – both traditional and technological – developed by the OUI, along with the university's open admissions policy, aim to open the world of higher education to all, irrespective of age, sex, place of residence or occupation, in order to enable every individual to realize his or her academic potential. Its home-study method allows students to pursue higher education, whenever and wherever convenient without interfering with their other personal and vocational obligations. The OUI offers over 500 academic courses in diverse fields, on different levels, and of varied scope, leading to B.A., B.Sc., M.A. and M.Sc. degrees. In all courses, students receive written materials intended for self-study, and optional face-to-face tutorial meetings are held in study centers throughout the country. All courses have websites on the Internet which include supplementary learning materials, links to databases and to Internet sites related to the topic of the course, and electronic asynchronous communication including discussion groups and e-mail (Erlich et al., 2002). The discussion groups enable individual and group communication between students and instructors, and among the students themselves. Some course sites include video clips and multimedia titles which enrich the course with interactive audio-visual learning materials. In some courses, computer-mediated tutorials almost entirely replace the face-to-face tutorial sessions. A number of

courses conduct distance tutorial sessions through the use of advanced technologies such as the OUI's broadband interactive distance teaching system, *Ofek*. *Ofek* enables the broadcast of lessons by the course coordinator or a guest lecturer, from a central studio to classrooms dispersed throughout the country (Beller, Kurtz, & Or, 1997; Kurtz, 1998) and recently, also to the Internet.

The OUI has developed an interactive on-line learning environment via the Internet called *Opus* which forms an integral part of the teaching and learning process (Aviv, 2000). *Opus* uses advanced information and communication technologies to benefit students and instructors from pedagogical, social and technological aspects (Jonassen et al., 1995; Beller, 1996, 1997). Based on these technologies, the OUI developed its CMC model of learning, which combines and integrates a broad spectrum of technological and media supplements to enhance the written course material in accordance with the needs of each course.

All the course websites are graphically similar, and include links to administrative information drawn directly from the OUI's central database: the course description and schedule, names and e-mail addresses of the teaching staff, and a list of students. The academic aspects of the sites include Hebrew-based applications that were especially developed to enable the instructor to update the data independently and effortlessly, with no need for Web programming skills. Fig. 1 shows a typical home page of a CMC course.

Each course website includes:

*Discussion groups.* The discussion groups (forums) are sub-divided into topics depending on the course content and structure. This is the main virtual meeting place for students in all the study groups around the country, and all registered students have read and write permissions.

*Links to other websites.* Links are sorted by subject, and direct students to useful sources of information related to the topic of the course, including links to similar courses in major universities around the world.

*Download files.* The course site allows the instructor to post all the files the student needs, beyond the textbook: exercises, solutions to exercises, sample examinations, etc.

Fig. 1. A typical home page of a CMC course.

*Bulletin board.* The bulletin board contains short messages posted by the instructor relating to the content of the course or concerning changes in tutorial schedules, deadlines for submitting assignments, etc.

The websites can be accessed by password via any Internet-connected computer in Israel and abroad. Although communication is at present basically asynchronous, the *Opus* team is developing synchronous technologies that will integrate more interactive aspects into the CMC learning process. The CMC model has two different aspects: The course site is utilized as both a *communication channel* and as a *study tool*.

As a *communication channel*, the site provides improved communication via the Internet between students and the instructor as well as among the students themselves. Thus, communication is more accessible, mutual and continuous throughout the semester.

As a *study tool*, the site offers various options: asynchronous discussion groups, synchronous discussions (text, voice and/or video), animated illustrations and multimedia applications. We believe that one of the important tools for distance education at the OUI today is the asynchronous discussion group. Synchronous activities are available in tutoring sessions held throughout the country, and there is a need to complement them with activities independent of time and place. Moreover, the software and hardware requirements are minimal and can be assumed to be available to all students.

These new teaching methods do not replace the written text books which are the basis for teaching at the OUI, but expand upon and enrich them. The incorporation of technological teaching methods is fully adapted to the written study materials which are prepared for OUI students by experts in their fields.

Despite the fact that the OUI has been integrating CMC tools into its courses for several years, in general, students use these tools to a relatively small extent. Our premise is that the use of these information and communication technologies depends on the level of skills and expertise of the individuals using them. To participate in CMC courses, students need basic computer literacy and a knowledge of computer applications including the Internet. For students lacking these skills, the OUI developed a Computer Literacy and Applications course (CLA). The course is taught using the technological tools themselves, thus providing the students with active training in computer-based technologies (Lupo & Erlich, 2001).

The purpose of this study is to determine whether taking CLA before taking a CMC course has an impact on students' participation in the CMC course and on the effective use of the various CMC tools on the course website.

The rest of this paper is structured as follows: Section 2 presents the rationale for developing CLA; Section 3 describes the research hypotheses and the research method; Section 4 presents the results; and Section 5 includes the discussion and recommendations.

## **2. The rationale for developing CLA**

To participate in any of the CMC courses, students need to have basic knowledge of computer applications, including the Internet. There are still many OUI students who begin their academic studies with little or no computer literacy and application know-how and, therefore, do not have sufficient skills to use the course website or participate in computer-aided activities.

In order to provide the computer literacy and applications necessary for CMC courses, the OUI developed a CLA course, based on a model of learning which integrates on-line technologies and traditional distance education teaching aids and combines them with Cookson's (2000) three-layer model. This model of learning allows students with no previous knowledge to take the course via distance learning. Teaching through the new technological tools themselves, thus providing active training in computer-based technologies, contributes greatly to the students' expertise in the use of these technological tools (Lupo & Erlich, 2001).

### 3. The study

#### 3.1. The research hypotheses

To determine the impact of taking CLA before taking a CMC course on students' participation in the CMC course and on their use of the various CMC tools, we tested the following hypotheses:

**Hypothesis 1.** Taking CLA before the CMC course affects students' use of the CMC course website. The number of students who visit the CMC course website will be higher among students who took CLA than among those who did not.

**Hypothesis 2.** Taking CLA before the CMC course affects the frequency of students' visits to the CMC course website. The frequency of visits to the website will be higher among students who took CLA than among those who did not.

**Hypothesis 3.** CLA contributes more to the use of the technical-administrative CMC tools than to the use of the pedagogical CMC tools.

#### 3.2. Participants

The sample consisted of 153 students enrolled in CMC courses in the Social Sciences in the Spring 2001/2 and Fall 2002/3 semesters. Participants were divided into two groups: 80 students who had taken CLA (52%), and 73 students who had not (48%).

Most of the students in the sample (75.7%) had previous Internet experience, while the rest had very little or no previous Internet experience. Regarding the stage of their studies, almost 80% were experienced students who had taken at least three courses at the OUI.

#### 3.3. Measures

We developed a two-part questionnaire. The first part is based upon the OUI's standard evaluation questionnaire administered each semester to students enrolled in CMC courses. It includes informative and background questions, items concerning the visits to the CMC course website, and items concerning taking CLA and satisfaction with it. The second part includes nine items and evaluates the contribution of CLA to the use of CMC tools. Participants are asked to indicate the extent to which CLA contributes to their use of CMC tools on a 5-point Likert scale,

from 1 (no contribution) to 5 (contributed greatly). This part of the questionnaire has two subscales. The first includes three items related to technical-administrative tools: the Bulletin Board System (BBS), electronic mail, and the electronic assignment delivery system. The second includes six items related to pedagogical tools: discussion groups, assignment solutions, tutorial summaries, information resources, self-tests, and the glossary of terms.

The reliability for both subscales and for all nine items was found to be high (technical-administrative tools subscale:  $\alpha = 0.7865$ ; pedagogical tool subscale:  $\alpha = 0.9052$ ; overall:  $\alpha = 0.9227$ ).

### 3.4. Procedure

The questionnaires were distributed to students enrolled in the various CMC courses towards the end of the semester as a part of the OUI's standard evaluation procedure. The hypotheses were tested by  $\chi^2$ , Mann-Whitney  $U$  and  $t$  tests. All the statistical analyses were carried out using SPSS (Statistical Package for the Social Sciences).

## 4. Results

Of the 153 students in the sample, the majority (79.1%) visited the CMC course website. The distribution of frequency of their visits was as follows: 63.5% of the students visited at least once a week, 29.5% visited 1–2 times a month, and only 7.0% visited only once or twice during the semester.

### 4.1. Visiting the CMC course website

#### 4.1.1. The first hypothesis

To test the first hypothesis concerning the number of students who visited the CMC course website, we conducted a  $\chi^2$  test. We found that the percentage of students who visited the CMC course website in the group which had taken CLA was significantly higher than in the group which had not (see Table 1).

#### 4.1.2. The second hypothesis

To test the second hypothesis concerning the frequency of visits to the CMC course website, we conducted a Mann-Whitney  $U$  test. No significant difference was found in the frequency of visits between the group which had taken CLA and the group which had not (see Table 2).

Table 1  
Students who visited the CMC course website (in percentages)

	Visited course website	Did not visit course website	$\chi^2$	$df$	$p$
Took CLA ( $n = 80$ )	88.8	11.2	9.47	1	<0.005
Did not take CLA ( $n = 73$ )	68.5	31.5			

Table 2  
Frequency of visits to the CMC course website (in percentages)

	1–2 times a semester	1–2 times a month	At least once a week	Mean rank	Mann–Whitney	<i>p</i>
Took CLA ( <i>n</i> = 67)	4.5	34.3	61.2	60.18	<i>U</i> = 1730	NS
Did not take CLA ( <i>n</i> = 52)	11.5	25.0	63.5	59.77	<i>Z</i> = 0.067	

Table 3  
Students who visited the CMC course website among students who did not take CLA (in percentages)

	Visited course website	Did not visit course website	$\chi^2$	<i>df</i>	<i>p</i>
Took prior CMC course ( <i>n</i> = 40)	80	20	3.36	1	NS
Took no prior CMC course ( <i>n</i> = 30)	60	40			
Had prior Internet experience ( <i>n</i> = 60)	75	25	6.61	1	<0.01
No prior Internet experience ( <i>n</i> = 13)	38.5	61.5			

In addition to testing the two hypotheses above, we performed some additional analyses. First, we analyzed the relationship between having taken CMC courses before the current one and visiting the CMC course website, among those who had not taken CLA. We found the percentage of students who visited the CMC course website in the group which had taken a CMC course before the current one to be higher than in the group which had not taken CMC courses before the current one (see Table 3). However, the difference was not found to be significant. Also, no significant difference was found between these two groups on the frequency of visits to the CMC course website.

Second, we analyzed the relationship between visiting the CMC course website and previous Internet experience, among those who had not taken CLA. We found that the percentage of students with moderate to high prior Internet experience who visited the CMC course website was significantly higher than that of students with little or no Internet experience (see Table 3). However, no significant difference was found between these two groups on the frequency of visits to the CMC course website.

#### 4.2. The contribution of CLA to the use of CMC tools

The contribution of CLA to the use of CMC tools, in the group which had taken CLA before the CMC course, was evaluated on a 5-point Likert scale, from 1 (no contribution) to 5 (contributed greatly). The mean contribution of CLA to the use of each of the nine CMC tools is shown in Table 4. The CMC tools are presented according to the two subscales: technical-administrative tools and pedagogical tools. For each subscale, the tools are listed in descending order of the contribution.

Table 4 shows that the contribution of CLA to the technical-administrative tools ranged from moderate to high, and to the pedagogical tools from low to moderate. Among the technical-administrative tools, the highest rated tool was the assignment delivery system. The contribution of CLA to the use of the pedagogical tools was highest for assignment solutions.

Table 4  
Contribution of CLA to the use of CMC tools

CMC tools	Mean	S.D.	<i>n</i>
Technical-administrative tools	3.34	1.25	89
Assignment delivery system	3.90	1.34	105
Electronic mail	3.23	1.44	107
Bulletin Board System (BBS)	2.98	1.54	98
Pedagogical tools	3.06	1.17	89
Assignment solutions	3.49	1.37	105
Discussion groups (forums)	3.17	1.42	107
Information resources	3.03	1.38	99
Self-tests	2.91	1.39	99
Glossary of terms	2.81	1.42	96
Tutorial summaries	2.67	1.39	100

#### 4.2.1. The third hypothesis

To test the third hypothesis, whether there is a difference between the contribution of CLA to the two subscales of CMC tools, we conducted a paired *t*-test on the total average scores of the two subscales. A significant difference was found between the contribution of CLA to the two subscales ( $t = 3.337$ ,  $df = 88$ ,  $p < 0.001$ ). CLA contributed significantly more to the use of technical-administrative tools. In addition, the correlation between the contribution of CLA to the technical-administrative tools and its contribution to the pedagogical tools was found to be highly positive and significant ( $r = 0.799$ ,  $p < 0.001$ ,  $n = 89$ ).

Students who had taken CLA before the CMC course were asked to rate the contribution of CLA to the overall use of CMC tools. The majority, 51%, indicated that it contributed to a great or to a very great extent, and 26% indicated that the contribution was moderate or small. Only 13% felt that the course did not contribute at all.

#### 4.3. Satisfaction with CLA

Students who had taken CLA before the CMC course were asked about their overall satisfaction with CLA and when it should be taken. The majority, 66%, were satisfied or very satisfied; 30% were moderately or a little satisfied, while only 4% were not satisfied at all. Concerning the timing of CLA, 66% of the participants recommended taking it before taking other CMC courses.

### 5. Discussion and recommendations

CMC is becoming an integral part of teaching and learning in general, and a necessary device in distance learning in particular. Yet students still use the CMC tools to a relatively small extent. It is difficult to cope with the technical tools without being computer literate. Some students prefer not to deal with the obstacles and do not participate in CMC courses at all; others try but give up, and still others try and may even cope successfully, but at the expense of time that could be devoted to their studies. At this stage, it is still the policy of the OUI to provide students with all

the materials they need for their studies in print (so that all students, with or without computer skills, have an equal chance). Thus, the course websites serve as a source of enrichment, a learning aid, and a convenient means of communication. As a result, our students are aware that they can manage without using the site, and if using it seems to them a problem, they can avoid it, confident that they can pass the course without going into the website.

However, there is no question that CMC courses are potentially a very positive addition to learning, especially at a distance. It is therefore important to determine what factors hinder or improve the rate of participation in CMC courses. The purpose of this study was to take a step in this direction by analyzing whether taking a computer literacy and applications course before CMC courses has an impact on participation in the CMC course and on the effective use of the various CMC tools.

Our findings indicate that there is a significant relationship between taking CLA and visiting the CMC course website. Significantly more students visited the CMC website among students who had taken CLA prior to the CMC course, than among those who did not. In addition, among those who did not take CLA, we found a significant relationship between previous Internet experience and visiting the CMC course website. On the other hand, no significant relationship was found between taking other CMC courses prior to the current CMC course and visiting the course website. It is apparent that CLA and previous Internet experience have a positive impact on visiting CMC course websites and participating actively in CMC courses. However, for those students who visited the CMC course website, no significant difference was found in the frequency of visits between the studied groups. The frequency of students' visits seems to depend on the contents of the individual course websites: sites rich in contents, of various kinds, are more frequently visited than those which only provide the basic administrative tools. Thus it is not enough to set up a course website; the site will only attract students if they believe they can gain from visiting it.

With regard to the extent to which CLA contributed to the use of CMC tools, we found that the contribution to the technical-administrative tools was moderate to high, and the contribution to the pedagogical tools was low to moderate. The contribution to technical-administrative tools was significantly higher than to the pedagogical tools, which confirms our premise that coping with the technical tools is the main obstacle to participation in a CMC course. When students have acquired the technical skills, they readily use the pedagogical tools. The findings of our study show that CLA makes a significant contribution to students' ability to cope with the technical tools.

In addition, the majority of the participants was satisfied with CLA, felt that it contributed to their use of CMC tools, and recommended that students take it prior to enrolling in CMC courses.

The major conclusions of our study are thus two-fold: CLA has a positive impact on both students' readiness to visit the CMC course website and on their ability to use the various CMC tools. Thus, we recommend offering a computer literacy and applications course before students enroll in CMC courses. At the OUI we have already begun to implement this recommendation. The computer literacy and applications course described in this study was developed for Social Science students and, relying on the conclusions of our study, the OUI has already developed such courses for Humanities and Science students, with the aim of making them required courses rather than electives, and strongly recommending that students take them before taking CMC courses. This policy will be applied in the coming academic year.

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