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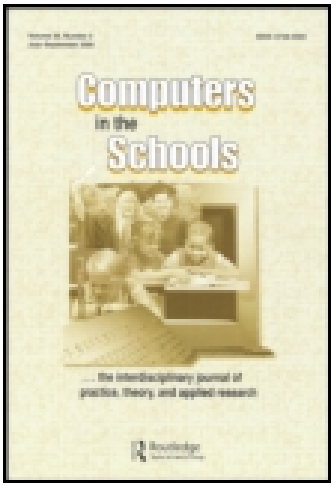

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Effective Use of CMC Tools in Interactive Online Learning

Judi Repman [a] , Cordelia Zinskie [b] & Randal D. Carlson [b]

[a] Department of Leadership, Technology and Human Development , College of Education, Georgia Southern University , Statesboro, GA, 30460-8131, USA

[b] Department of Curriculum, Foundations, and Reading , College of Education, Georgia Southern University , Statesboro, GA, 30460-8144, USA

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Judi Repman
Cordelia Zinskie
Randal D. Carlson

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SUMMARY. Instructors designing online learning can utilize an array of computer-mediated communication tools to promote student engagement and interaction. This paper surveys the tools available, focusing on uses of the tools for learning (Type II uses). Research results and implications for practice are presented for asynchronous (e-mail, listserv, discussion boards, and blogs/Weblogs) and synchronous (chat, instant messaging, and audio and video Web-based conferencing) tools.
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JUDI REPMAN is Professor, Department of Leadership, Technology and Human Development, College of Education, Georgia Southern University, Statesboro, GA 30460-8131 (E-mail: jrepman@georgiasouthern.edu).
CORDELIA ZINSKIE is Associate Professor, Department of Curriculum, Foundations, and Reading, College of Education, Georgia Southern University, Statesboro, GA 30460-8144 (E-mail: czinskie@georgiasouthern.edu).
RANDAL D. CARLSON is Associate Professor, Department of Leadership, Technology and Human Development, College of Education, Georgia Southern University, Statesboro, GA 30460-8131 (E-mail: rcarlson@georgiasouthern.edu).

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KEYWORDS. Online learning, computer-mediated communication, interaction, synchronous, asynchronous, e-mail, listserv, discussion boards, chat, instant messaging, audioconferencing, videoconferencing

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INTRODUCTION

As online and hybrid course offerings increase, interest in the computer-mediated communication (CMC) tools that facilitate online learning also increases. Good Type I tools simplify and automate many previously tedious and/or problematic tasks. These tools also offer considerable potential as Type II tools. Type II tools can deeply engage students in a variety of critical interactions, including learner-content interactions, learner-faculty interactions, and learner-learner interactions (Moore, 1989). This paper presents an overview of these tools in two groups. The first group includes asynchronous tools such as e-mail, listserv, discussion boards, and blogs/Weblogs. Synchronous tools, including chat, instant messaging, and audio and video Web-based conferencing, are the second group of CMC tools examined. Online course management systems incorporate some or all of these tools but the discussion presented assumes that issues related to the use of CMC transcend the use of specific management systems.

DEFINING INTERACTION IN ONLINE LEARNING

Many models have been proposed to define and describe the nature of interaction in learning. Hirumi (2002) offered a basic definition: "Each of the events associated with an instructional strategy may be considered an interaction, a transaction that occurs between the learner and other human or non-human resources" (p. 22). Moore's (1989) classification of interactions into learner-content, learner-faculty, and learner-learner interactions provides a flexible system for examination of CMC tools. Jung, Choi, Lim, and Leem (2002) applied Moore's classification system in a study of Web-based interaction. They suggested three types of interaction: academic interaction, collaborative interaction, and interpersonal or social interaction.

Research examining the relationship between interaction and student learning in online classes frames this discussion. Bannan-Ritland (2002) used meta-analysis to generate a list of 19 research outcomes. Key findings include:

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1. Peer participation and instructor feedback are perceived as significant elements of interactivity;
2. High levels of interaction need to be modeled by the instructor for students;
3. Different technologies can support different kinds of instructional activities (or interactions); and
4. The instructor's role is significant in promoting interactivity and indicates a change in role from face-to-face instructional contexts. (p. 172)

These findings indicate that instructors must be familiar with the full range of CMC tools available and make strategic decisions when matching the tool with the task.

ASYNCHRONOUS CMC TOOLS

E-Mail

E-mail defined. An e-mail is a simple electronic text message that allows communication to take place independent of time or place (Jung et al., 2002). Messages can be sent from an instructor to an individual learner or to a group of learners; likewise, learners can communicate with the instructor or with fellow learners.

Educational uses of e-mail. Instructors can use e-mail to provide information about class logistics, answer questions about assignments, send assignments by attachment, respond to requests for grades, and acknowledge any messages received (Johnson & Huff, 2000). Honeycutt (2001) noted the benefits of e-mail for online peer response to other students' writing, while Vonderwell (2003) found e-mail effective in motivating undergraduate education students.

Advantages of e-mail. E-mail requires minimal computer literacy (Johnson & Huff, 2000), and the attachment feature allows students to submit assignments privately and efficiently (Tiene, 2002). E-mail allows instructors to provide immediate feedback to students (Eastman & Swift, 2002; Ng, 2001). Graduate students in a study by Johnson and Huff noted that e-mail technology made the instructor seem more accessible. Vonderwell's (2003) undergraduate students liked the fact that the online environment provided greater opportunity for asking the instructor questions.

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Disadvantages of e-mail. Use of e-mail can result in a very teacher-centered approach to instruction (Ng, 2001). The accessibility of the instructor via e-mail also creates a disadvantage in that students become dependent upon instructors to provide information about the course, information that is sometimes already readily available to students on the course Web site (Vonderwell, 2003).

Things to consider. Ng (2001) stated that the instructor must clearly specify expectations or requirements related to use of e-mail within the online course. Vonderwell (2003) noted that instructors should not answer questions from students in instances where students should be able to locate the answers themselves.

Listserv

Listserv defined. Listserv is an early e-mail-based application that has been used extensively for collaboration and interaction. Listservs are established by a listowner, who may also serve as a moderator. Messages posted to the list are distributed to all members via e-mail. Most Web-based course management systems do not include listserv as an instructional tool.

Educational uses of listservs. Tiene (2000) studied use of a listserv as an extension of face-to-face class discussions. Graduate students found the listserv to be a convenient method of asynchronous communication, although they did not want to eliminate face-to-face discussions. Listservs have a history of use by higher education faculty as collaborative, current awareness tools and these uses can be replicated in online classrooms (Hyman, 2003).

Advantages of listservs. Listserv is easy to use. Habitual e-mail users may respond to discussions quickly since messages are sent directly to the user's e-mail account. Hyman (2003) reviewed research focusing on listserv use in scholarly discussion groups. He noted that "ListServ has been the great equalizer, allowing all parties to speak in the same manner, regardless of their level of technology and bandwidth access" (p. 23).

Disadvantages of listserv. Listserv messages will be received in the user's regular e-mail account, which may be overloaded with e-mail and spam. Without the structure of a threaded discussion, off-topic posts may dominate listserv messages. Listserv messages may be seen as impermanent and quickly deleted (Hyman, 2003).

Things to consider. The level of commitment required of the listowner/moderator is an important consideration. Listserv messages should be

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archived, especially if participation is a graded activity. Instead of establishing a class listserv, students could subscribe to an existing listserv.

Discussion Boards

Discussion boards defined. Also known as threaded discussions, forums, class bulletin boards or conferences, discussion boards are key elements in online course management systems. Different threads (or topics) may be established by instructors or students. Course management systems archive the threads (usually until deleted by the instructor) and track student use of discussion boards.

Educational uses of discussion boards. In many online classes, the discussion board is the primary tool used to facilitate interaction. Group work, such as case or project-based instructional activities, offers a natural match for discussion boards (Angeli, Valanides, & Bonk, 2003; Bender, 2003). Discussion boards can also be used for role-playing, exchange of written work, debates, sharing of resources such as course-related Web sites, and interaction with guest experts (Bender, 2003).

Advantages of discussion boards. Lapadat (2002) suggested that synchronous CMC tools pose significant limitations such as linearity, brevity, and shallowness. From her research, Lapadat concluded that "the process of participating in asynchronous online conferences enhances literate forms of higher order thinking in specific ways" (Thinking by Writing in Asynchronous Conferences section, ¶ 1). For a variety of reasons (language barriers, self-confidence, etc.) many learners never participate in face-to-face class discussions. Discussion boards are flexible tools that allow for a variety of instructional strategies (Bender, 2003; Hirumi, 2002).

Disadvantages of discussion boards. Hughes and Hewson (2001) suggested that CMC tools like discussion boards and e-mail fail to capture much of the richness of face-to-face communication. Other research indicated that deep learning or critical thinking does not naturally occur with discussion boards (Angeli et al., 2003). Many students fail to participate in threaded discussions (Bender, 2003; Chen & Hung, 2002). Assessing discussion board participation can be challenging (Bender, 2003; Knowlton, 2003).

Things to consider. Hirumi (2002) stressed the importance of following systematic instructional design processes in identifying effective uses of Type II CMC tools. Based on his own experience, Peirce (2003) stressed the importance of designing questions that "provoke discom-

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fort, unsettle confirmed notions, uncover misconceptions, inspire curiosity, [and] pose problems" (p. 314).

Blogs/Weblogs

Blogs/Weblogs defined. A Weblog or blog is an informal personal or professional journal published on the Web. It is typically updated frequently. Each entry may contain a title, short description, the name of the author, and the date posted. Advanced content may be added in the form of text, URLs, pictures and graphics, audio and/or video, or other files. Creators and users of blogs (called "bloggers") can access the Weblog from anywhere that they can access the Web. Additionally, many blogs are available to others in the form of RSS (Real Simple Syndication or Rich Site Summary) feeds. RSS is used with blogs to allow the reader to subscribe to current, content-focused channels of information (Murphy, 2003).

Educational uses of blogs/Weblogs. Blogs can be used as online student portfolios or filing cabinets to store assignments or projects. They can be class portals where teachers keep homework assignments, links, handouts, or syllabi. They can serve as collaborative writing spaces where students share ideas and work together to jointly express ideas. Blogs have served as reader's guides for literature study, as newspapers, or as project sites where students contribute the content. Weblogs enable the user to manage the knowledge that the community assembles–in fact, they have been proposed as cheaper alternatives to course management systems (Richardson, 2004).

Advantages of blogs/Weblogs. The open, flexible nature of blogs encourages dialog among the discussion participants. When faculty invite experts in the field to participate, students are able to connect their classroom to the real world. This has a positive effect on the students who recognize that they are writing for a community much larger than the class itself (Richardson, 2003). Mitchell (2004) suggested that Weblogs are a dynamic source of content as opposed to the static sources contained in most current publications.

Disadvantages of blogs/Weblogs. Educators have been slow to adopt Weblogs for reasons of privacy, security, and access. The flexible, informal nature of blogs can also be a disadvantage in terms of maintaining focus and fostering deep, critical thinking. Blogs/Weblogs, like listserv, require the use of software not commonly included in online course management packages.

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Things to consider. Use of blogs/Weblogs is still new so for many users there will be a learning curve. Harrsch (2003) suggested that collaborative learning is enhanced by the formation of smaller interest groups within a larger distributed system, with each participant being a member of several smaller, overlapping interest groups. This complex structure might be confusing to both instructors and students.

SYNCHRONOUS CMC TOOLS

Chat

Chat defined. Chat is a form of synchronous text-based communication that can occur among many individuals (Anderson, 1999). Chat rooms allow students and instructor to meet electronically at the same time, no matter where they are (Eastman & Swift, 2002). Typed messages can be seen by all persons in the chat room, who then have an opportunity to respond (Kittleson, 2002). Online course management systems typically allow chat sessions to be recorded for later viewing.

Educational uses of chat. Uses can range from course "business" tasks such as holding virtual office hours, clarifying questions and assignments, and addressing technology problems (Gonzales & de Montes, 2001) to instructional activities, including sharing examples (McKeage, 2001), brainstorming and problem solving (Ingram, Hathorn, & Evans, 2000), and reflecting on field experiences (Burnett, 2003; Kirk, 2000).

Advantages of chat. Chat creates an immediacy of communication (much like a class discussion) (Ingram et al., 2000), and chat rooms are effective for both learner-learner and faculty-learner interaction (Eastman & Swift, 2002; Wang & Newlin, 2001). Specific advantages for students include increased connectedness to the instructor and course (Wang & Newlin, 2001), greater development of social relationships and class culture (Im & Lee, 2003/2004; Kirk, 2000), and more active involvement in their learning (Eastman & Swift, 2002).

Disadvantages of chat. The specific technical requirements for the chat function (e.g., java-enabled computer), Internet disconnections, and slow response times often affect participation (Farrior & Gallagher, 2000; Tiene, 2002). In addition, Branon and Essex (2001) noted that many students lack the requisite typing skills needed for timely communication. Chat sessions often produce disjointed conversations and/or multiple conversations that students find difficult to follow (Gonzales & de Montes, 2001; Kittleson, 2002; Tiene, 2002). This problem becomes

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magnified when the chat group becomes too large (Branon & Essex, 2001; Ingram et al., 2000).

Things to consider. Eastman and Swift (2002) noted that chat must be thoughtfully implemented and supported by the instructor. Many online instructors and/or researchers (e.g., Branon & Essex, 2001; Eastman & Swift, 2002; Kittleson, 2002) have stated that a protocol must be established for chatting. Instructor tasks include keeping the group focused, informing students of what is acceptable and effective participation (Berzenyi, 2000), and promoting interactivity among learners (Bannan- Ritland, 2002).

Instant Messaging (IM)

Instant messaging defined. Instant messaging (IM) is a synchronous communication method that uses Internet technology to send real-time text messages (Dunne, 2002). The user creates a list of individuals (the "buddy list") that he/she wishes to communicate with; messages can be sent to one person or to several as long as the person(s) is online (Riva, 2002; Tyson, n.d.). Although secure IM software exists (for a fee), most nonbusiness users tend to use the publicly accessible (free) IM clients. Most IM programs have chat, file-sharing, the ability to share images and sounds, and a talk feature (Tyson, n.d.).

Educational uses of instant messaging. The most common users of IM are college, high, and junior high students so there has not been much attention to use of IM in higher education (Cohn, 2002). Farmer (2003) surveyed college students and found that IM is strong and gaining on e-mail as their primary online communication tool; faculty members, however, have been slow to embrace this technology.

IM can be used for learner-instructor communication, collaboration on research projects, virtual conferences, remote guest speakers, class discussions, and prompt feedback (Cohn, 2002; Farmer, 2003; Fetterman, 2002; Tyson, n.d.). Farmer reported that incorporation of IM into online instruction can increase the social presence of distance students. Fetterman reported, however, that chat rooms might be better than IM for extended discussion.

Advantages of instant messaging. Farmer (2003) stated that for communication to be effective on the Internet, immediate and constant connectivity is essential. Benefits of IM include its ease of use and the ability to communicate in real time. Users can maintain control of their contact list, converse with more than one person at a time, and block messages from specific individuals (Dunne, 2002).

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Disadvantages of instant messaging. There is a problem with interoperability when using most free IM clients (Tyson, n.d.). Farmer (2003) noted that major drawbacks include privacy and security concerns, although secure IM software addresses some of these issues. IM also has the potential to be a great "time waster."

Things to consider. Farmer (2003) characterized IM as the "faculty nightmare." Use of IM adds to the growing expectation of instructors being available at all times; it also adds more time to the faculty workload. Cohn (2002) noted that with the increased usage of communication tools like IM, faculty members are going to need the ability to simultaneously attend to several different activities.

Audio and Video Web-Based Conferencing (Audioconferencing and Videoconferencing)

Audio and video Web-based conferencing defined. Audioconferencing is a synchronous technology that allows verbal interaction among individuals or groups at a distance. Videoconferencing describes a system where multiple non-collocated participants communicate, see, and hear each other in real time, using a combination of technologies.

Educational uses of audio and video Web-based conferencing. Audioconferences are useful when verbal interaction between the educational participants is most important. Videoconferencing provides opportunities for higher level thinking via live face-to-face interaction with peers, tutors, or experts. Videoconferencing mitigates the disadvantages of learning at a distance through real-time interactive experiences, without regard to location. A partial list of activities includes practicing language speaking with native speakers, team teaching between locations, presenting student and teacher resources, communicating with mentors and subject matter experts, observing demonstrations in other schools, sharing experiences with students from other cultures, and enhancing learning at a distance (SBC, 2004).

Advantages of audio and video Web-based conferences. Software programs can be used in conjunction with the video and audio feeds to allow file exchange or collaborative work. If the instructor relies on conceptual comments and uses few or no graphics, audioconferences are a low cost alternative to a videoconference. Videoconferences most closely replicate the traditional, face-to-face classroom experience.

Disadvantages of audio and video Web-based conferences. Users without computer expertise may find setting up the systems and connecting for a conference challenging. Since both are synchronous

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systems, users must participate in real time. High-quality videoconferencing requires high-speed Internet connections, further limiting participation.

Things to consider. Students should be provided with detailed technical specifications and instructions well in advance of scheduled activities. A trial run eliminates many problems that may occur. Provisions should be made for recording the session so that students can review materials presented. Pre-instructional activities (such as directed readings or providing questions prior to the conference) will also help promote engagement.

CONCLUSION

All of the CMC tools (asynchronous and synchronous) discussed here have been proven or have the potential to increase interaction and enhance learning in the online environment. CMC tools themselves continue to evolve in terms of the features they include, and new tools may be developed. While the focus on student learning remains constant, online instructors will find that their instructional strategies must be flexible. Bender (2003) noted that it is critical for online instructors to develop a high level of comfort with technology to accompany subject matter expertise. Peirce (2003) summed up the rewards and challenges: "[O]nline professors can aim higher than merely teaching competent thinking. They can promote intellectual growth and encourage students to question favored approaches and methodologies that dominate our disciplines" (pp. 336-337).

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