Student Participation and Interactivity Using Asynchronous Computer-Mediated Communication for Resolution of an Undergraduate Capstone Management Case Study

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Abstract

Online discussion activities are designed for computer-mediated learning activities in face-to-face, hybrid, and totally online courses.

The use of asynchronous computer-mediated communication (A-CMC) coupled with authentic workplace case studies provides students in the protected learning environment with opportunities to practice workplace decision making and communication. In this study, communication behaviors of transmitter and receiver were analyzed to determine participation and interactivity in communication among small-group participants in a health information management capstone management course.

Key words: online learning; technology; case study

The resolution of authentic case studies adapted from real-world situations provides an opportunity for students to participate in collaborative learning activities in a controlled classroom learning environment. Using a constructivist and learner-centered viewpoint, a teacher can adapt authentic case studies that are resolved through collaboration by groups rather than by individuals. Gustafson observes that an integral part of understanding course concepts is collaboration with peers.[1] Students reported that discussion boards, a learning technology consisting of computer-mediated communication (CMC) that allows participants to discuss course topics online, respond to each other's comments, and share ideas, are being utilized to facilitate this collaboration.

CMC is written text submitted to a common electronic area in which all participants exchange written text. Communication occurs without knowledge of any communicator's verbal emphasis or any emphasis that would be provided by body posturing and movements. Experiments with CMC in learning situations[2] attribute the richness and efficiency of exchange to factors inherent in the technology and to the phenomenon of group functioning in a virtual environment, including the following:

- Asynchronicity allowing people separated by time and space to be linked;
- Flexible access allowing multiple and varied types of collaboration, unhindered by time and space;
- Exactness of expression possible with written messages;
- Direct, informal style and brevity demanded by limited screen space;
- Multiple inputs made possible by group exchanges; and
- Reduction of social pressure due to the virtual quality of the group.

Furthermore, collaboration through asynchronous computer-mediated communication (A-CMC) adds further authenticity to the experience as workplace environments now use A-CMC more than previously. E-mail is an external, asynchronous method of communication to others, while an organization's intranet communities provide additional internal communication opportunities. Asynchronous discussion allows interactivity and communication among participants. The participants are able to collaborate and interact at different times and places and yet discuss and solve problems together.

Teachers who prepare pre-professional students for workplace challenges should develop learning activities that promote authentic learning. One area of authentic learning that can be used to simulate workplace activities is the use of A-CMC to solve problems.

Educational Framework

Constructivist and learner-centered environments are enhanced when students are required to complete authentic tasks analogous to the kinds of products and performances required of practicing professionals.[3] Constructivist goals focus on students' ability to solve real-life, practical problems, and tend to focus on projects that require solutions to problems rather than instructional sequences.[4] Most constructivist approaches heavily emphasize work in groups rather than as individuals to solve problems.

The main objective of collaborative learning is for learners to work together and share knowledge, yet still stand separately as individual learners.[5] Students engaged in collaborative learning communities build and strengthen skills commanded by today's workforce.[6] Klemm observes that individual achievement in the real world typically depends on how well a person can work with other people and that professionals typically work in teams and must always network with peers in their field.[7]

Klemm further suggests that asynchronous computer conferencing could make collaborative learning more effective than team learning in face-to-face traditional classroom courses for the following reasons:

- All students can find the time to do their share of the work. No longer do they have an excuse of conflicting work or study schedules.
- Thoughts are expressed in a more clear and focused way because everything is done in writing.
- Everybody is more accountable. Everyone sees what everyone else is doing (and not doing).
- All inputs are organized and archived for later review and update.[8]

The most effective learning occurs when learners transport what they have learned to various and diverse new situations.[9]

Asynchronous and Synchronous Computer-Mediated Communication in the Workplace

A-CMC allows people to communicate where and when they are able without requiring them to meet at a specific time and/or place. Two common methods of A-CMC are e-mail and discussion groups. A-CMC has replaced other means of communication because missed phone calls and the need for travel for face-to-face meetings increase the time required for problem resolution. Even employees at the same employment campus often use A-CMC rather than face-to-face interaction for communication and problem resolution. Overall, A-CMC reduces nonproductive time and results in more efficient work performance as well as more efficient use of personnel time.

Synchronous computer-mediated communication (S-CMC) requires that people meet at a specific time for voice communication or voice and picture communications. Two common methods of S-CMC are audio conferencing and audio/video conferencing. Communication using S-CMC requires participants to commit to a specific time, but they do not have to be in the same geographic location. Therefore, S-CMC reduces nonproductive travel time but does require a specified time commitment from the participants.

Authenticating the Learning Activity

Alumni submit authentic workplace situations to the teacher of pre-professional undergraduate health information students in the course described in this study. The alumni identify needed skills and offer suggestions for improvement of graduates' skills. Authentic de-identified workplace situations are adapted into case studies for inclusion as student learning activities.

Over the last few years, alumni have offered anecdotal observations about ongoing changes in workplace communication. Workplace communication is changing as CMC becomes an important component of daily work activities. In healthcare, employees communicate patient and client healthcare information needed to provide clinical medical care as well as information needed in the administration of healthcare as a business. Healthcare organizations use two main methods of communication, written and verbal. Historically, most meetings were face-to-face; some were conducted using telephone conference calls. Now, the common communication methods of face-to-face meetings and telephone conference calls have been joined by asynchronous communication using the organization's intranet or the Internet.

Many healthcare institutions are part of multihospital healthcare systems that require frequent meetings to discuss corporate issues and challenges common to all institutions in the corporation. Efficient and economical use of personnel time and financial resources is essential to assuring fiscal responsibility and potential profit for the healthcare system. Many meetings that were previously conducted face-to-face are now conducted using CMC.

Conceptual Framework for Participation and Interactivity in Asynchronous Computer-Mediated Communication

Bretz distinguishes three levels of interactive behavior.[10] The first, Simulated Interactivity, occurs when an artificial intelligence system interacts with humans. The second, Genuine Interactivity, occurs when there is both a transmitter and a receiver of information. The third, Quasi Interactivity, occurs when a user asks a question and a programmed machine gives an answer. For the purposes of this study, Bretz' Genuine Interactivity, which requires both a transmitter and a receiver of information, will be used as the operational definition of interactivity. Bretz requires three actions for Genuine Interactivity to occur. (See Figure 1.)

Figure 1
Three Actions Necessary for Genuine Interactivity

Transmitter		Receiver	
A	→	B	A transmits to B.
B	→	A	B elaborates about A's information.
A	→	B	A responds to B.

Henri, F. "Distance Learning and Computer-mediated Communication: Interactive, Quasi-interactive or Monologue?" In C. O'Malley (Vol. Ed.), *Computer Supported Collaborative Learning: Series F. Computer and Systems Sciences.* New York: Springer-Verlag, 1995. Vol. 128, 145–164.

Henri referred to Bretz's Genuine Interactivity[11] to develop an operational definition for A-CMC. Henri's operational definition of A-CMC is the use of interactive technologies that allow groups of users to exchange text messages via computer, at a time convenient for the user, and with users separated by time and distance. Henri further noted that interactivity is equated with learning, or the interactive learning process, and that most authors equate the interactive learning process with participation.[12]

In CMC, all messages are considered participation. Furthermore, participation would then equal interactivity, so if one measures participation, one is measuring interactivity.

Henri's Analytical Framework (1992) consists of the following:

- Participative Dimension—transmissions by one person or one group;
- Social Dimension—statement or part of statement not related to subject matter;
- Interactive Dimension—chain of connected messages;
- Cognitive Dimension—statement exhibiting knowledge and skills related to the learning process; and
- Metacognitive Dimension—statement that is related to general knowledge and skills and shows awareness, self-control, and self-regulation of learning.[13]

For the purposes of this study, only the Participative Dimension and Interactive Dimension were used. The Interactive Dimension was simplified to the general categories of Explicit Interaction and Implicit Interaction messages; Henri's original model expanded these categories to differentiate between Explicit Direct Answers, Explicit Direct Comments, Implicit Indirect Answers, and Implicit Indirect Comments.

Participation was operationally defined as one message written by one user. Quantitative analysis determined the number of total number of messages per group, the average number of messages per group, and a numeric range for the number of messages submitted per student.

Interactivity was operationally defined as the identification of statements as Explicit Interaction, Implicit Interaction, or non-explicit/non-implicit statements. Statements that did not meet Henri's Explicit Interaction or Implicit Interaction category definitions were categorized as non-explicit/non-implicit statements.

Instructional Design

Twenty-six undergraduate senior students were enrolled in a capstone management course for their last semester prior to graduation from a midwestern U.S. public university. Upon graduation, students are awarded bachelor of science degrees in health information management, which have been awarded since 1974 with a graduation rate of 20 to 25 students per year.

Students enrolled in the course have completed two prerequisite courses in principles of management and human resource management. Additionally, students have completed a required three-credit-hour internship at a hospital or medical center; the internship is a health information professional skills-based practicum.

Historically, students have resolved authentic case studies solely through written, electronically submitted individual and/or group assignments or in face-to-face classroom experiences with oral presentations. No classroom activity was designed to allow students to practice problem-solving using A-CMC; however, A-CMC was identified by alumni as a necessary skill for success in the workplace. To provide guided experiences and to allow students to practice skills they would need as graduates, one case study was redesigned from a face-to-face activity to an A-CMC activity. This A-CMC activity was designed as a pilot activity.

All students had prior experience working in small groups to solve case studies in a face-to-face environment. No students had prior experience using A-CMC activities for case study resolution. All students had previously participated in face-to-face classroom problem-solving activities as part of authentic learning activities earlier in this course and in courses in the previous semester. Students solved problems through authentic case study activities developed by the teacher from workplace situations provided by program alumni. Identifiable data were removed from the case studies to protect the confidentiality and privacy of the organization and personnel. The teacher introduced the case studies to the students as authentic workplace situations encountered by program alumni during their first years of professional work after graduation.

The authentic management case study that was selected for A-CMC was modified for use as a classroom activity. Modifications included de-identification of the organization, its geographical location, and the name of the person submitting the case study. The case study reflected the experiences of a new program graduate in a first employment opportunity as a healthcare manager. The case study was complex as several jobs, job descriptions, consultations, and reports were provided in their entirety or in summaries and required analyses by the students to determine management priorities.

The teacher provided each student with a hard copy of the written case study with the activity instructions during face-to-face classroom instruction. Students were randomly selected and placed in one of seven groups. Five groups had four student members in each group; two groups had three student members in each group. Each group functioned independently of the other groups. Questions were directed to the teacher; no group was allowed to request clarification about the case study or seek consultation from another student group.

Student groups were instructed to analyze the case study and develop a prioritized work plan for the manager with data to support the prioritization. Students had previously practiced case resolution using a specific problem-solving model that included the following steps: identify the problem; gather data about the problem; identify potential solutions supported by data; select the best solution based on data, budget, and personnel; and assess the effect of the chosen solution. The last two steps of the problem-solving model, implementation of the best solution to resolve the problem and assessment of the effect of the solution, were not required for this assignment.

All students were experienced with the instructional course management software, WebCT, and previously had used WebCT for e-mail, submission of assignments, and completion of examinations and surveys. Students were not experienced with case study resolution using A-CMC. The teacher provided face-to-face information and answered student questions about the case study and mechanics of A-CMC through the discussion board included in the instructional course management system (CMS). The discussion board allowed posting, viewing, and responding to comments, and enabled discussion by students and the teacher. Discussion content was written, submitted, and viewed in a threaded discussion format similar to e-mail. As students

had successfully used the CMS's e-mail function in previous student-to-teacher and teacher-to-student communications, students verbally expressed confidence about using the discussion board features.

The case study activity was designed as a two-part assignment in which A-CMC was required for completion of both parts. The teacher determined submission dates for each part of the assignment; any late submission received zero points. Part I required that each group develop its prioritized and justified work plan in a private discussion group and then submit its work plan to an anonymous discussion area viewed by all students. Part II required all groups to review and analyze the seven anonymous work plans. Each group selected the best work plan based on that group's selection criteria. Each group anonymously submitted its selection criteria and its analytical comparison of the work plans to the discussion board for all students to view.

For the purposes of this study, student participation and interactivity from only Part I of the two-part assignment were analyzed and reported.

Data Analysis Methods

Student discussion entries were downloaded as Microsoft Word files from the CMS. The format of the download allowed the retention of the document content with established and connected relationships among each student, each group, and each message, with each message's date and time maintained. This was important to verify that the threaded relationships of messages written in the discussions were maintained during the download process.

The following operational definitions were used for analysis to determine participation and interactivity:

1. One discussion Message was defined as one entry into the discussion board on a specific date and time.
2. One discussion Interaction was defined as written content in any Message that referred to an explicit, implicit, or non-explicit/non-implicit reference to another Message, about another person, or about a group of persons. A single Message could have one or more Interactions.

First, a quantitative analysis was performed to determine the frequency of Messages and Interactions. The quantitative analysis was followed by a mixed-method analysis using quantitative and qualitative analyses with the adaptation of Henri's Analytical Framework described above.[14]

For the quantitative analysis to determine participation, the discussion Messages and Interactions from the 26 students were downloaded from WebCT into a Microsoft Word document. Second, the number of Messages submitted per student was tallied. Third, the number of Messages per group was tallied. The tallied numbers were derived by counting the total number of Messages for a single group member and then for each group as a whole. (See Table 1.)

Table 1
Message and Interaction Totals

Group	No. of Students	Messages	Explicit Interaction	Implicit Interaction	Non-explicit/Non-implicit Interaction	Total Interactions
1	4	**17**	13	11	3	**27**
2	4	**14**	4	12	1	**17**
3	4	**17**	16	10	3	**29**
4	4	**13**	13	12	0	**25**
5	3	**8**	9	12	0	**21**
6	3	**13**	8	6	3	**17**
7	4	**13**	9	7	2	**18**
Average		13.57	10.29	10	1.71	22
Total	**26**	**95**	**72**	**70**	**12**	**154**

Qualitative analysis, as adapted from Henri's Analytical Framework,[15] was used to determine interactivity. Each statement in each Message was coded to one of three qualitative categories, and then the number of occurrences in each category was tallied for each individual student and for each group. (See Table 1.) The qualitative categories were defined as follows:

- Explicit Interaction—any statement containing specific reference to another message, to another person, or to a group of persons.
- Implicit Interaction—any statement containing an implicit reference to another message, to another person, or to a group of persons.
- Non-explicit/Non-implicit Interaction—any statement that does not meet the operational definition of the Explicit Interaction category or the Implicit Interaction category.

Data Analysis

The twenty-six students in the course were randomly assigned to seven online discussion groups. The purpose of the assignment was to use online discussion to apply a prescribed problem-solving model to an authentic de-identified professional case study. Student communication was limited to asynchronous online discussion only.

Data were analyzed to determine frequency of participation. The 26 students authored a total of 95 Messages; each group authored an average of 13.57 Messages. Within the 95 Messages, 154 Interactions were identified as tabulated using Henri's Analytical Framework,[16] for an average of 22 Interactions per student group. (See Table 1.) Within each group, the average individual Messages ranged from 2.66 to 4.33 Interactions per individual group participant.

To determine interactivity, the content of Interactions was analyzed using mixed-method analyzes. Seventy-two of the 154 Interactions were coded as Explicit Interaction because those statements contained a specific reference to another message, person, or group of people. Seventy of the 154 statements were coded as Implicit Interaction because they contained an implicit reference to another message, person, or group of people. Twelve statements were coded as non-explicit/non-implicit interaction because the statement contained neither explicit nor implicit reference to another message, person, or group of persons. Therefore, 142 of the 154 Interactions (92.2 percent) were coded as Explicit Interaction or Implicit Interaction.

Conclusion

Collaborative learning can be demonstrated through problem solving of authentic case studies. When students use asynchronous computer-mediated learning experiences, teachers must analyze participation and interactivity. This pilot study examined the participation frequency, interactivity, and content of asynchronous discussion generated by students while solving authentic case studies. Henri's Analytical Framework provided the guidelines used in the qualitative analysis.[17]

This pilot study was limited to Part I of the course assignment. This study did not include the analysis of interaction among groups, satisfaction or dissatisfaction among groups or group members with the online discussion format, or satisfaction or dissatisfaction with the use of an authentic case study. No alumni were consulted as external reviewers to assess the solution of the authentic case study.

Future studies should include replication of this pilot study with future students enrolled in the same course. At that time, a study could be conducted toward the development of a rubric to improve and guide instructor judgment to consistently assess case study resolution.[18] The development of rubrics to provide consistent assessment is difficult and yet is a necessary part of teaching and learning.

Further research could include content assessment through the use of data mining principles, theories, and software technology. Data mining is a complex activity; therefore, the possibilities of using data mining for content analysis will depend on the identification of user-friendly tools that are easily learned and applied by the assessing teacher.[19]

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Notes

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