What Makes Online Synchronous Discussions Engaging?

Results from a Case Study in Pre-service Teacher Education.

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Abstract: Over the last decade, there has been an increased use of computer mediated communication (CMC) within higher education. What type of instructor's role and what type of questions increase student participation and encourage responsiveness in synchronous online discussions? Is there a positive correlation between student participation in CMC and learning outcomes? This case study attempts to provide answers to these questions. Participants were 20 pre-service teachers who attended a blended e-learning science course. Content analysis (Cohen's kappa for interrater reliability=0.74) of transcripts from 9 synchronous discussions in WebCT™ revealed three important characteristics for learner-centered discussions: a structured approach of implementation, the instructor's role as the discussion facilitator and the use of questions that query understanding and encourage application, analysis and synthesis. Instructional strategies to improve online discussion implementation are also indicated.

Introduction/Theoretical Framework

According to Rourke and Anderson (2004), "the primary role of networked computers in higher education has shifted from presenting structured, pre-programmed learning materials to facilitating communication" (p.5). Chatrooms (synchronous communication) and threaded discussions (asynchronous communication) have entered many higher education courses to provide opportunities for students to interact with faculty and other students on course topics or issues (Meyer, 2004). Concerning the usefulness of implementing online discussions in tertiary education there is evidence to support their effectiveness (Picciano, 2002) even though overall, "researchers…identify large variations in the quality of interaction and the achieved learning outcomes" (Strijbos, De Laat, Martens and Jochems, 2004, p.61). According to Romiszowski and Mason (2004), "the literature on the topic is large and growing, but most of it is anecdotal rather than empirical" (p.399). Moreover, "asynchronous modes seem to predominate" (p.398) as most studies focus on asynchronous (delayed time) communication, such as discussion boards rather than synchronous (real time) discussions. Some studies in CMC specifically focused on student roles (Mason, 1992; Strijbos, De Laat, Martens and Jochems, 2004). Mason (1992) looked for indicators of collaborative interactions, such as messages which "instead of merely exchanging information, build one on another and add new meaning to a discussion" (p. 104). Other studies focused on the online instructor's role (Beaudin, 1999).

However, a number of questions on how online synchronous discussions can be effectively integrated into an academic setting to enhance learning and how teacher and student roles are affected by this integration, are left unanswered. This study attempts to provide an answer to the following questions: a) What type of instructor's role and b) what type of questions increase student participation and encourage interaction and responsiveness in online synchronous discussions? c) Is there a positive correlation between student participation in CMC and learning outcomes? Student participation in CMC is defined as the number of messages students posted in the discussions. Responsiveness is defined as the number of messages posted that build on or reflect on other students' ideas.

Methodology

Participants

The participants of this study were twenty (20) senior pre-service service teachers (henceforward referred to as "students") who attended the course "Applications of Information Technology in the Teaching of Science at Elementary School" at the University of Cyprus over the spring semester 2004. The sample was homogenous with regard to age and gender (12 female, age=22 and 8 male, age=24). The course focused on the development of students' modeling skills and incorporated e-learning through the use of WebCT™ and face-to-face teaching. Students had no prior experience with blended e-learning. The 20 students participated in the first online discussion. Due to management difficulties faced, they were randomly assigned into two groups of 10 students, which alternated each week. Each student was expected to participate in a total of 5 biweekly discussions on modeling issues, the first one including all students and 4 additional ones, each including a group of 10 students.

The transcripts from nine (9) one-hour synchronous discussions that took place in WebCT™ among students were the subject of the analyses. All discussions were structured since they were based on assigned readings and guiding questions on modeling issues. The guiding questions for all discussions were posted prior to the online activity.

Procedures

Each discussion was printed and dated, and individual student names were blacked out and replaced with codes to ensure anonymity and confidentiality. The unit of analysis was each individual posting. To extract meaning from the data and understand the dynamics of CMC, content analysis was performed. The analysis of the instructor's and the students' postings was done separately but followed similar methods. Principles of Glasser and Strauss' grounded theory were implemented and emerging categories were used. For the analysis of the instructor's postings, ideas from the Rourke and Anderson's (2002) framework on the "roles and responsibilities of teaching presence" were used. The questions posed by the instructor were also classified and analyzed separately. For the analysis of the students' postings, general guidelines from Mason's (1992) typology of conference messages related to the educational values they display were used. Emergent coding was applied according to which categories were established following some preliminary examination of the data.

Two researchers independently reviewed the transcripts of the first discussion and segmented them in individual postings. Intercoder reliability was 0.94. To establish reliability for a coding schema, first, the researchers independently reviewed all transcripts and came up with a set of categories that formed the framework. Second, they compared notes and reconciled differences that showed up on their initial frameworks. Third, they used a consolidated framework to independently apply coding. Fourth, they checked the reliability of the coding (Cohen's kappa=0.56). The level of reliability was not initially acceptable. Therefore the researchers repeated the previous steps and recoded all transcripts to establish a reliability of 0.74, which was considered satisfactory.

Data Analysis

Students' and Instructor's Participation

It should first be noted that even though the research design of the study referred to the random assignment of the 20 participants in two groups of 10 students that would alternate for discussions 2 to 9, several students did not abide by this rule. As a result, the number of participants in each discussion ranged from 6 to 11, with the exception of the first discussion in which 16 out of 20 students participated. Overall, 1862 messages were posted in all 9 discussions. The instructor's postings (402) accounted for 21.59% while students' postings (total=1460, M=73.0, SD=43.27) accounted for 78.41% of the total number of postings. The students' average number of postings per discussion ranged from 3.4 to 32.8 (M=17.56, SD=7.54) while the instructor's average number of postings per discussion was 44.66. Students' final grades in the course ranged from 6 to 9.5 on a 10-point scale (M=8.20, SD=1.03).

Instructor's Discourse

Table 1 (left part) refers to the analysis of the instructor's role in the online discussions and the four categories that emerged from the analysis of the postings.

Instructor's role	*Total*	*Mean*	*SD*	*%*	*Students' responses*	*Total*	*Mean*	*SD*	*%*
1.Facilitating discussion	190	21.11	6.17	47.26	1.Social interaction	275	30.55	24.98	18.84
2.Confirming understanding	73	8.11	6.86	18.16	2.Understanding	106	11.77	5.33	7.26
3.Prompting/ encouraging	74	8.22	6.74	18.41	3.New argument	76	8.44	6.02	5.21
4.Asking questions	65	7.22	4.68	16.17	4.Reflecting	676	75.11	31.67	46.29
					5.Factual knowledge	24	2.66	2.69	1.64
					6.Applic./Anal./Synt.	119	13.22	7.54	8.15
					7.Misconception	10	1.11	1.76	0.68
					8.Other	174	19.33	29.61	11.92
Total postings	402			100	Total postings	1460			100

Table 1: *Analysis of instructor's and students' postings in all 9 discussions*

The first category, facilitating discussion (47.26%) refers to a range of the instructor's responsibilities falling under two main roles: a) time management (14.68%) and b) facilitation of inquiry (32.58%).

a) Time management refers to the following responsibilities:

1) establishing time parameters (1.99%),
2) utilizing medium effectively (1.99%),
3) assessing the efficacy of the process (0.75%) and
4) initiating the beginning and closure of the discussion (9.95%).

b) Facilitation of inquiry refers to the following responsibilities:

1) identifying areas of agreement/disagreement (2.24%),
2) seeking to reach consensus/understanding (1.24%),
3) focusing the discussion on specific issues (8.46%),
4) summarizing the discussion (2.98%),
5) diagnosing misconceptions (4.97%),
6) commenting based on students' ideas (8.95%) and
7) identifying and resolving confusion (3.74%).

The second category, confirming understanding (18.16%) refers to the instructor's explicit attempts to verify students' understanding by assessment and explanatory feedback. The third category, prompting/encouraging (18.41%) refers to the instructor's explicit attempts to draw in participants (13.18%) and prompt the discussion by encouraging, acknowledging or reinforcing student contributions (5.23%). The fourth category, asking questions (16.17%) refers to six types of questions that emerged from the analysis focusing on:

a) extracting factual knowledge (2.48%),
b) asking students to provide examples (1.24%),
c) querying students' understanding (5.47%),
d) asking students to apply knowledge and understanding (2.25%),
e) analyzing content by having students compare, contrast and evaluate (1.99%), and
f) challenging students to synthesize information (2.74%).

Focusing only on the analysis of questions, the majority of questions referred to querying students' understanding (33.80%), while a smaller percentage referred to questions that extract factual knowledge (15.34%) or ask students to provide examples (7.76%). The combined percentage of questions referring to application (13.9%), analysis (12.3%) and synthesis (16.9%) is 43.1%, which accounts for almost half of the questions asked.

Students' Discourse

Table 1 (right part) refers to the analysis of the students' postings. Eight (8) categories emerged: 1) Social interaction (18.84%) refers to students' greetings and any comments not directly relevant to the topic, in the beginning and ending of the discussions. Within each discussion it was increased in two parts: a) from the time students logged in until the time the instructor initiated the beginning of the discussion, and b) from the time the instructor conveyed the end of the discussion until the time that all students logged out. 2) Demonstrating understanding (7.26%) refers to students' thoughtful responses, insightful comments as well as providing examples

and explanations.3) Presenting a new argument (5.21%) refers to students' postings providing a new idea, usually as a response to a question by the instructor or a peer. 4) Reflecting on other people's ideas (46.29%) comprised of building on a previous argument (16.64%), expressing agreement/disagreement (13.28%), asking a question (6.77%) or clarification (5.28%) and expressing an opinion (4.32%). 5) Demonstrating factual knowledge (1.64%) refers to postings that showed prior knowledge or had a reference to or direct quote from the assigned readings. 6) Application (3.15%) refers to postings that applied knowledge in a given or hypothetical situation. Analysis (3.02%) refers to postings that compared and contrasted concepts or evaluated content. Synthesis (1.98%) refers to postings that synthesized knowledge from different sources into a coherent argument. 7) Misconception (0.68%) refers to postings expressing a concept in an incorrect way. 8) Other (11.92%) includes comments not directly relevant to the topic of the discussion, feedback on the course and suggestions.

The last two discussions revolved around a critique of the virtual learning environment. Students indicated several advantages of the online discussions, such as the fact that they were "*constructive and allowed for exchange of ideas*". They recognized the fact that an online discussion encourages reflection as they stated that: *"it allows people to process what they want to say before actually expressing it. This is very important. One can also easily trace what was said before*". Students indicated time requirements as one of the important disadvantages of discussions: *"they took one extra hour from our time biweekly*", they were *"time-consuming and did not always include a substantial conclusion*". Time restrictions in the synchronous mode was also a concern, as students commented that: *"you can't catch up with the pace of the discussion*", *"we were all talking at the same time and did not always read what other people were writing"*. With regard to specific suggestions, students pointed out that online discussions *"should have a stricter structure imposed*", *"a clearly stated conclusion*" and *"specific time allocated for discussion and specific time for recapitulation"*. These students' comments indicate their need for increased guidance and structure, which can probably be attributed to the fact that they were novices in CMC.

Finally, to investigate whether there is a relationship between student participation in CMC and learning outcomes, a correlation was performed between students' contribution to the online discussions and their final grade in the course. Student participation in CMC, is defined operationally as the percentage of individual contribution (frequency of individual postings) divided by the percentage of group contribution to the online discussions (total number of postings). Learning outcomes are defined operationally as being equal with the final grade. The assessment method of the course was based on an individual project (40%), the students' collaborative construction of models using Stagecast Creator™ and WebCT™ (20%), the submission of reflective journals (15%), participation in online discussions (15%), construction of a concept map (5%) and completion of a pretest and a posttest (5%). The assumption that was made was that the final grade of a student-centered course that implemented a learning by inquiry approach reflects students' active learning to a great extent. The correlation between students' contribution to the online discussions and their final grade in the course was statistically significant r (20) = 0.595, $p < 0.001$.

Results and Interpretations of Findings

Participation, Engagement and Responsiveness to Other People's Postings

As far as participation is concerned, online discussions were student-centered since students (78.41%) dominated the discussion, rather than the instructor (21.59%). The fact that there was a small percentage of new arguments posted (5.2%) as opposed to a significantly greater percentage of students' postings that indicated a reflection on other people's ideas (46.3%) showed that students were taking different opinions under consideration. Moreover, the minimal percentages of identified misconceptions (0.7%) and factual knowledge demonstrations (1.6%) as opposed to the higher percentages of demonstrating understanding (7.3%) and application, analysis or synthesis (8.2%) furthermore indicated a successful implementation of the online discussions. Another finding that supported students' high degree of participation and engagement referred to the fact that almost all students were responsive in some way to instructor's questions or prompts. As a result, most students' engagement with the content and their focus on task during the discussions was high.

Another aspect of students' engagement, not directly relevant to learning outcomes, referred to their virtual social interaction (18.83%). Overall, social interaction gradually and significantly decreased from the first to the ninth discussion (92, 35, 20, 20, 37, 15, 31, 17 and 8 postings respectively). The gradual decrease of online interactions indicated a potential novelty effect for these students, who were involved in online synchronous discussions for the first time in their teacher education program.

An important characteristic of the virtual learning environment of WebCT™ that should be noted refers to the fact that it can accommodate for students with special needs. One student who was blind was capable of following the online discussions because the environment was compatible with his reading software Supernova6.5 as long as students used either only Greek or only English characters.

The Instructor's Role as the Discussion Facilitator

Almost half (47.26%) of the instructor's postings reflected a way of facilitating the discussion (tab. 1). One of the important aspects of facilitation is effective time management (14.68%), which involves not only indicating the beginning and ending of a conversation but also continually assessing the efficacy of the process to inform decisions as to whether a current theme would be allowed to unfold or whether the focus of the discussion should be redirected. The instructor was purposefully creating a learning environment wherein students were in charge of their own learning and responsive to each other in accordance with the "facilitating inquiry" approach (32.58%). The instructor's major responsibilities referred to commenting on students' ideas (8.95%), identifying and resolving confusion (3.74%), identifying areas of agreement or disagreement (2.24%) and seeking to reach consensus (1.24%). The instructor was flexible and responsive to students needs. Based on diagnosing misconceptions (4.97%), the level of discussion was adjusted by focusing the discussion on specific themes (8.46%) and summarizing it (2.98%) to provide structure.

The instructor motivated students to increase participation and encouraged student interaction by acknowledging and reinforcing contribution to the discussion, through a prompting role (18.16%). This helped students become engaged, gradually more comfortable with the virtual learning environment and responsible for each discussion. Equally important with regard to learning outcomes and students' understanding of the material, was the instructor's confirmatory role (18.16%), according to which she verified understanding by assessment and by providing students with explanatory feedback, especially in cases where misconceptions were identified.

Types of Questions to Increase Engagement

Concerning the analysis of the types of questions the instructor used to increase student participation and interaction in the discussion, the majority of questions referred to querying students' understanding (33.8%), while a smaller percentage referred to questions that extract factual knowledge (15.38%) or ask students to provide examples (7.7%). The combined percentage of questions referring to application, analysis and synthesis was 43.1%, which accounts for almost half of the questions asked. These percentages are in accordance with a "facilitating inquiry" approach, which focuses on higher order thinking skills and active learning rather than rote memorization. Relating students' reactions with the type of questions implemented, the percentage of students' responses was low for demonstrating factual knowledge (1.6%), larger for demonstrating understanding of concepts (7.3%) and higher for the combined score of application, analysis and synthesis responses (8.2%).

Discussion/Implications

This study described how a virtual learning environment can be effectively employed for online synchronous student-centered discussions. Analyses revealed three characteristics that are important for focused online discussions, outside of normal class time, in which students are engaged and responsive to each other's postings. The first characteristic refers to a structured approach of implementation, integrating course readings and guiding questions posted in advance to allow for students' preparation. This supports Romiszowski and Mason's (2004) argument that "the use of discussion forums brings the student directly into contact with the content material of the course" (p.401). In the context of the present study, students' comments and reflections on each others' ideas accounted for almost half (46.29%) of their postings. Students had a clear on-task focus throughout the duration of the actual online discussion as they tried to debate, argue, and react to the assigned readings and their peers' ideas. This finding contradicts Bonk, Hansen, et al.'s (1998) (as cited in Chara, Bonk and Angeli, 2000) finding of students' non responsiveness in synchronous discussions.

The second characteristic that promotes focused discussions refers to the instructor's role as the discussion facilitator. Apart from setting the discussion's agenda, another crucial part of the instructor's role refers to actively moderating the discussion by focusing on specific themes within time restrictions. The instructor's role includes but

is not limited to responsibilities such as identifying and resolving confusion, identifying areas of agreement or disagreement, seeking to reach consensus, diagnosing misconceptions and verifying understanding through assessment and explanatory feedback. In the motivation aspect, an instructor also needs to constantly encourage interaction by acknowledging and reinforcing student contribution to the discussion.

The third characteristic refers to the fact that in addition to the initial comprehensive questions that should be posted in advance to frame the discussion, it seems that the type of questions asked during the discussion is also important, which is in agreement with Meyer's (2004) finding that: "the question initiating each of the online discussions influences the level of the responses from students" (p.101). Sixteen percent (16.2%) of the total of instructor's postings (tab.1) consisted of several types of questions. The instructor mostly used higher order questions of application, analysis and synthesis and questions to query students' understanding, rather than questions that extract factual knowledge. Consequently, students' postings reflected higher order thinking skills (8.15%) rather than recalling (1.64%).

This case study has shown an effective way in which online learning activities can be integrated in a course to work in synergy with in-class activities. The online discussion as a supportive resource reinforced the face-to-face component of the course. Due to time restrictions, for example, in some instances the initial questions posed to students were not adequately addressed. In a blended e-learning approach this did not constitute a major problem since, to compensate for that, the instructor had the opportunity to use the questions and issues raised within the online discussions in the face-to-face class meetings. This approach would probably not have been possible if the course was offered entirely online.

Drawing on students' comments and informative suggestions, several instructional strategies can be pointed out to increase learner engagement and interaction in online discussions. These strategies refer to having students work individually or in small groups to: a) synthesize the content of the discussions by reviewing the postings and outlining major themes, b) generate and post their own discussion questions prior to the online activity, c) take the place of the instructor to facilitate the discussion and d) develop specific outcomes such as recommendations for an instructional application. Another feature that would be of great value to novice students who lack experience with CMC and need more guidance is establishing and disseminating a protocol at the beginning of the semester, outlining their responsibilities, appropriate types of interaction, and what to focus on during the discussions.

This study indicated a positive correlation (r (20) = 0.595, $p < 0.001$) between participation in online discussions, measured quantitatively, and learning outcomes, as reflected on the course final grade. Directions for further research include investigating not just the quantity and types of online interaction patterns, but also the impact of online synchronous or asynchronous modes of communication on students' performance, active learning and long term retention of course material.

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