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Labeled Postings for Asynchronous Interaction

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The Internet promotes computer-mediated communications, and asynchronous learning network systems permit more flexibility in time, space, and interaction than the synchronous mode of learning. The key point of asynchronous learning is the materials for web-aided teaching and the flow of knowledge. This research focuses on improving online interaction by using labeled postings embedded in the e-Forum discussion tool developed for this research. Subjects for the study were students who enrolled in the "Drug and Nutrient Interaction" course using the Problem-Based Learning (PBL) approach. Students' online discussion data were gathered during the academic years of 2004 and 2006. Data from the study reveal that the design of labels for postings promoted interactive responses among learners, and the frequency of personal discussion increased. Self-improvement and the development of new subjects from discussion forums were also observed among learners.

Educators in the field of higher education are working to improve the quality of teaching practices, and the Internet is a tool that holds great potential to assist in these efforts (Wang, 2007). Online professional develop-

ment courses have been growing rapidly over the past few years. The structure of these courses varies enormously from fully online to occasionally face-to-face. Among the different forms of online courses, some last a full semester, some are more limited in time and scope. However, almost all use the threaded discussion forum as a central locus of course activity. The discussion forum has thus become the subject of considerable research, both in terms of designing discussion forum activities that support learning and of using the discussion forums to create a community that will support learning (Collison, Elbaum, Haavind, & Tinker, 2000; Lowes, Lin, & Wang, 2007).

In a web-based learning setting, students are encouraged to take responsibility for their own learning and use the Internet as a study tool that allows information to be retrieved quickly to facilitate both discussion among members and the synthesis of knowledge. However, some studies have found that most students are incapable of regulating their learning to optimize self-directed learning in online environments (Azevedo & Cromley, 2004; Kramarski & Mizrachi, 2006). The limitation of textual communication through an online discussion tool might be a key element for effective knowledge interaction. Innovations in communication technology merit serious consideration for improving the quality of communication in various educational settings (Downing, Schooley, Mate, Nelson, & Martinez, 1988).

In health and medical science education, Problem Based Learning (PBL) was characterized by using authentic cases as the starting point for professional training. The use of realistic learning experiences was valued highly for substantially enhancing students' motivation to learn and augmented their ability to integrate knowledge from foundation disciplines in pursuit of a solution to practical professional problems (Albion & Gibson, 2000; Haghparast, Sedghizadeh, Shuler, Ferati & Christersson, 2007; Valadares, 2007). To achieve more meaningful learning, the use of the PBL approach underlines the notion of engaging students in an active process of individual and cooperative learning of interrelated themes (Valadares). Within a web-based PBL setting, an effective interaction tool to facilitate mutual understanding about shared knowledge is important to encourage more self-directed learning and meaningful interactions within the asynchronous online learning environment (ChanLin & Chan, 2007). As applied, it has been shown to help students develop better reasoning processes, critical thinking, communication skills, and an increased motivation to learn.

Asynchronous electronic discussions using a bulletin board/discussion board aim to promote cognitive and critical thinking skills (Wu & Hiltz, 2004) and facilitate student interaction with course materials on a deeper level (Biesenbach-Lucas, 2003). Although students are provided with sufficient time to reflect on course context and have deeper interactions, there are more limitations than with face-to-face dialogue (King, 2001). For example, to reflect more effective communication, issues that need to be addressed and discussed often require referencing to an individual's argument. From a student-oriented learning environment, students' messages that are lengthy, cognitively deep, and embedded with peer references might be an indication of their understanding of course content and dialogue for knowledge interaction (Wang, 2007).

To improve the quality of students' learning, it is essential to increase and improve the interaction among participants in the learning community (Wang, 2007). In any web-based learning context, discussion tasks can be an effective learning approach that leads to progressive knowledge-seeking inquiry and expansive learning. However, it is a concern that the use of discussion will not necessarily promote expansive learning or higher level thinking unless students are cognitively involved in the process of interaction. The social technology tools developed for learning need to motivate a learner to be involved in activities with other students, organizations, and segments of a larger community, which envelope the context of the online learning environment (Maurino, 2007). The use of interactive technologies in the learning environment should promote not only person-to-group but also person-to-person communication, where each person's contributions are respected. Thus, these technologies should have built-in mechanisms for the community to synthesize diverse views. Moreover, students need to use high level cognitive skills such as inferences and judgment as well as metacognitive strategies related to reflecting on experience and self-awareness (Hara, Bonk, & Angeli, 2000).

While online learning has become the focus of much research regarding its efficacy in improving student learning outcomes (Skylar et. al., 2005; Summers, Waigandt, & Whittaker, 2005), the mechanism of online interaction is generally treated as a major subset of distance education and the technological innovation of interactivity is emphasized. Appropriate communication and learning systems for distance education would be those in which students communicate extensively with instructors and with each other (Maurino, 2007). Through deep and efficient conversation, learners can construct knowledge, filter it, discover individual differences, and strive to mutual understanding.

In computer-mediated communication, online discussions are conducted asynchronously with discussion threads and responses enabling students to post contributions to multiple and concurrent conversational threads without being constrained by time and the processes of turn-taking often used to manage face-to-face discussions. In an online learning setting, students should have more time to evaluate carefully and respond to other students' contributions to produce more in-depth discussions (Brooks & Jeong, 2007). However, it has also been observed that despite the convenience of using asynchronous threaded discussions, students rarely respond to one another's points, and so there is a lack of continuity on specific issue (Koschmann, 2003; Veerman, 2003; Dozier , 2001). Students often produce discussions that lack coherence and depth (Brooks & Jeong).

As internet-based distance learning becomes more and more prevalent in both academic and training environments, there is an increasing need to determine critical elements related to effective online interaction. To promote social learning in a technology-mediated discourse, it is necessary to emphasize cultural experiences, habits, behavior, and methods of reasoning. This is especially significant given the limitations of communication over physical distance (Moore, 1991). Thus, innovations to improve the quantity and quality of interaction are frequently discussed in the literature on online learning (Anderson, 2002). For example, Langille and Pelletier (2003) suggested the use of cognotes—notes used to label postings as a guiding framework for students before posting. Nussbaum, Hartley, Sinatra, Reynolds, and Bendixen (2002) suggested using note starters and elaborated cases to trigger more student argumentation in their discussions. Both approaches are designed to lead to increased argumentation in students' postings.

In this study, the use of labeled postings is proposed for a discussion forum to achieve efficient interaction in a web-based learning context. Specifically, the purpose of this study was to observe whether labeled postings improve online interactions in discussion forums in a web-based setting, in terms of the continuation of a threaded topic, initiatives of new topics, and number of postings for each student.

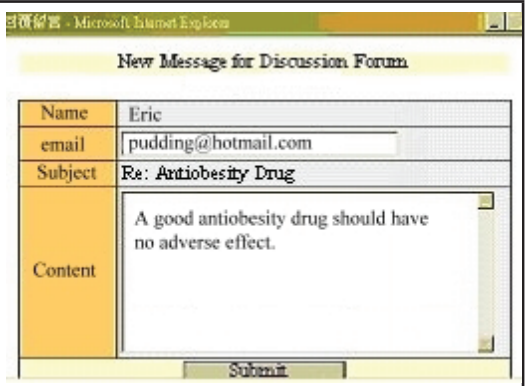
METHOD

The Instructional Settings and Subjects

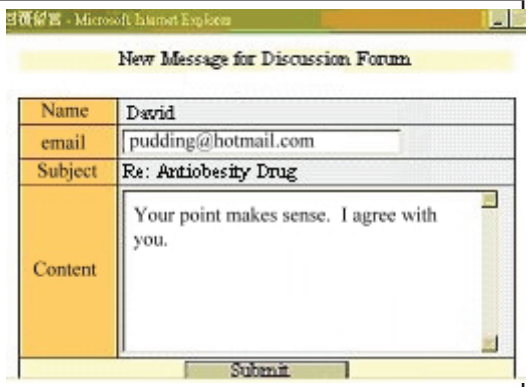
The web-based course, "Drug and Nutrient Interactions," contained "PBL scenario," "presentation of instructional content," "related resources," and "library and information skills." The presentation of authentic problem scenarios in the instructional content served as the starting point for learning to increase the motivation of students. Then students progressed by integrating knowledge from foundation disciplines in pursuit of solutions to practical professional problems. In the learning setting, tasks were designed to encourage a sense of involvement in the use of reference materials to solve problems. For example, for each problem scenario, students were requested to use references to support their assumptions and findings. In addition to instructional contents about various drug and nutrient interactions, instruction regarding how to prepare a research project and the use of academic electronic medical resources and databases was integrated in the web-based learning course. Students were provided with opportunities to search for topics of research and given information for exploring the area of interest. Details about the design of the web-based PBL instruction were reported in ChanLin & Chan (2004; 2007)

Subjects participating in the study were sophomore students majoring in Food and Nutrition at Providence University, Taiwan, enrolled in the "Drug and Nutrient Interaction" course during the academic years of 2004 and 2006 (50 participants in 2004 and 101 participants in 2006). The course was an elective, offered every other year, and its aim was to acquaint students with various drug-and-nutrient interactions in preparation for students becoming dieticians. The web-based course, "Drug and Nutrient Interactions" and learning tasks used across these two academic years were the same. The only difference was the use of labeled postings in discussion forums for the year 2006. Examples of postings with/without a labeled posting are shown in Figure 1. In both academic years, web-based learning lasted for 10 weeks. To fulfill the course requirement, students in both academic years signed up with 5-6 other persons, forming a team, to accomplish a group research project by the end of the course. They were encouraged to learn independently and cooperatively with their peers.

Example of unlabeled posting



Reaction from Eric



Reply from David

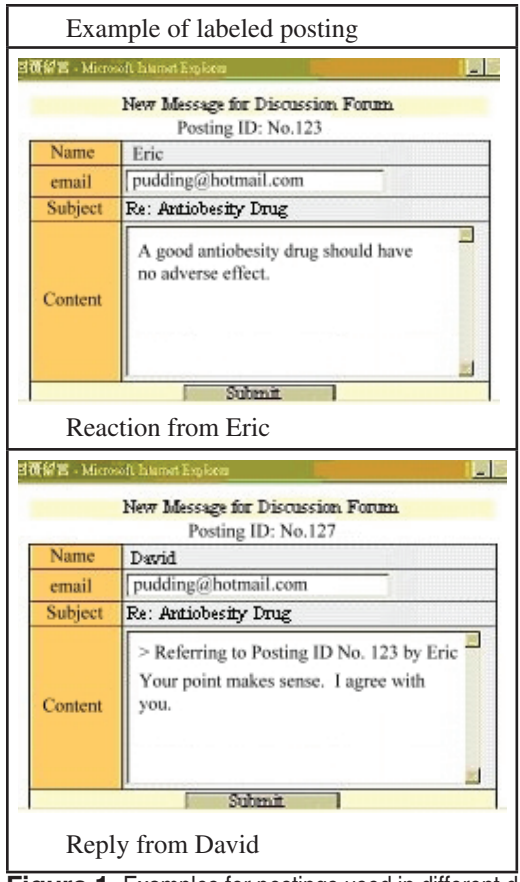


Figure 1. Examples for postings used in different designs

Design of Posting ID

The rationale underlying the use of labeled postings was to provide an ID number for each posting in threaded discussions so that students could refer to the ID number when responses to any specific posting were needed. In this design, students were provided with more convenient options for responding to a topic in a threaded discussion or to a specific posting from one of their peers. The use of labeled postings could overcome some of the limitations in asynchronous interaction in online discourse due to the lack of real-time and face-to-face features resulting from the time lag in interac-

tion. Meaningful responses can promote continuous interaction and effective communication in asynchronous online interaction.

Traditional threaded discussion emphasizes person-to-group interaction. However, in an interactive society, person-to-person dialogue needs to be addressed to meet specific communication needs. The use of labeling was intended to encourage more person-to-person interactions. Since all postings in the threaded discussion were labeled, all the postings could be responded to individually by their ID numbers. Examples of postings with/without a labeled posting are shown in Figure 1.

Students' postings in their group discussion forums across two academic years were compared. Analyses to evaluate the use of label postings were conducted statistically. In addition to quantitative analysis, textual data in discussion (for the labeled-posting group) were also gathered. To fully understand the benefit of using labeled postings, unstructured interviews were also conducted for 17 students in the labeled posting group to assess their reactions to the design (question examples are listed in Table 1). To reference the data presented, the data were coded as shown in Table 2.

Table 1
Question Examples in Interview

●	Please describe your experience in using discussion forum in the course.
●	What were the experiences you had in our discussion forum? How was it different from other chat room or online discussions?
●	In your responses to …..(Topics), you ….(use specific way) to share ideas with your group. Could you explain what you expected to get? And how did you learn from this experience?
●	From these postings (Screens were downloaded and shown during the interviews), you responded to a specific posting instead of responding to the topics. Could you describe your experience of different needs in online communication?
●	Please describe your experiences in using labeled postings.
●	What were the benefits of using labeled postings that you experienced in the asynchronous online communication?

Table 2
Description of Data Codes

Code	Example	Description of data
IV#mmdd(#n)	IV#0917	Interview data on September 17 (#1, 2…More than one subject was interviewed on this date)
LG#GGTT	LG#0222	Learning Group 02, Topic #22
LG#GGTTDDD	LG#0222009	Learning Group 02, Topic #22, Message #0 09

RESULTS

For comparison across two academic years, 2004 (using unlabeled postings) and 2006 (using labeled postings), there was a total of 50 participants (divided into 12 groups) in 2004, and 101 participants (divided into 18 groups) in 2006. Textual-based data from the discussion forum indicated that the total postings were 949 and 2,753 for 2004 and 2006 respectively. Total topic threads were 284 for unlabeled posting group, and 467 for the labeled posting group. However, not all the topics posted received responses, only 45.07% (128) topics in the unlabeled posting group and 53.32% (249) topics in the labeled posting group received responses. To further analyze how labeled postings encouraged extension of a discussion thread, threaded topics that received more than 10 postings were identified and summed. A total of 88 topics (4.89 ± 3.50 per group) were obtained in the labeled posting group, while only 10 topics (0.83 ± 0.83 per group) were obtained in the unlabeled posting group.

Statistical analysis of students postings in the group discussion forum showed that the mean postings per person increased from 18.98 (± 8.35) to 27.26 (± 18.50). Students in the labeled posting group posted more than those in the unlabeled posting group (T_{149} = 3.011, p = 0.003). The data showed that students with labeled postings performed more actively than those with unlabeled postings. Statistical analyses of the results are shown in Table 3. The data gathered from interviews and the online discussion forum also revealed supporting evidence on the use of labeled posting for promoting more effective communication in online asynchronous interaction. The findings are summarized as follows.

Table 3
Comparison of Students' Interaction

Design of Discussion Forum	Without Label Posting	With Labeled Posting
Total Participants [a] (academic year)	50 (2004)	101 (2006)
Number of Group	12	18
Total Postings	949	2753
Total Topics	284	467
Total Responded Topics	128 (45.07% was responded postings)	249 (53.32% was responded postings)
Mean Postings per Person	18.98 (± 8.35)	27.26 (± 18.50)
Mean Postings per Topic	3.34	5.90
Total topics threaded over ten postings	10	88
Topics threaded over ten postings per group	0.83 (± 0.83)	4.89 (± 3.50)
Total Responses Using Labeled Posting [b]	N/A	427

[a] Only students involved full-time were included.
[b] Labeled posting was only used in academic year 2006

MEETING THE NEED FOR PERSON-TO-PERSON COMMUNICATION

Student responses reflected the need for person-to-person communication. As an asynchronous mode of communication, the online discussion was considered less natural than face-to-face interaction, demanding more effort from the communicators. Some students believed the traditional mode of asynchronous communication could not satisfy their personal discussion needs (IV#0922#2, IV#1001). However, they appreciated the use of postings to make communication more efficient. Students' reactions to the use of labeled postings were positively reflected from the interview data. "*The*

posting indicated name and ID Number. He knew what I was talking about" (IV#0930#2).

Making Communication More Functional for Web-Based Learning

Students expressed their use of labeled postings in several ways: (a) responding to comments or requesting further explanation from a specific person (LG#051556,LG#0631012, LG0915035), (b) elaborating on a specific posting (LG#0711010, LG#1816008), (c) answering questions or providing further information for a specific inquiry (LG#0709007, LG#0922008, LG#1715026, LG#1635003), (d) providing verbal encouragement to a group member's effort (LG#0509004, LG#1105011), (e) expressing reflections (LG#0915028, LG#1028002, LG#1210021), and (f) reaching a decision (LG#0409, LG#0504). Respondents also agreed that the use of labeled postings fostered the continuity of a posted issue. Any arguments posted could be referred to and questioned for clarification. Details about any arguments could be elaborated on and further explained. All these features were important for achieving effective discussion in a web-based learning setting.

Correcting Mistakes

The use of labeled postings was an efficient way to help students monitor their learning. "When the teacher responded to my postings, I would pay attention to the message I posted. I looked back and checked what I got" (IV#0930#1). The same points were made by several students (IV#0923#1, IV#1008#1). The citation of labeled postings was often used for self-correction since students were better able to make corrections due to the specificity of the labeled postings cited. From the data gathered in the group discussion forum, labeled postings were often self-cited for self-correction or as a supplement to the original postings (e.g., LG#1634000 - LG#1634004, LG#1320000 - LG#1320001, LG#0103000 - LG#0103001). Several students also addressed their citation of labeled posting to refer to the massage they previously posted (IV#0917, IV#0922, IV#1001). *"Compared with MSN online chat, postings in our discussion forum were easily retrieved and referred to."* Students considered this feature important for monitoring their own learning (IV#0923#1, IV#0929#2).

Extending an Issue for Discussion

The use of labeled postings also served as an extension point for switching group discussion to another new topic. *"Using different functions in discussion forum, such as issuing a new topic, responding to the topic, or responding to a specific posting, we found that our discussion extended from the original interest to a new focus*" (IV#0923#1). Similar points were also made by different respondents (IV#1008). The data gathered in the group discussion forum revealed similar phenomena. For example, in LG#0518 and LG#0704, while the group members were discussing a specific topic, the respondent to the cited postings was also leading the discussion to a new topic problem (LG#0518, LG#0704). Since cited postings sometimes triggered a new interest, group members might switch their discussion to a different focus threaded from the initiation.

Discussion

One of the great advantages of text-based, asynchronous online communication is the time it allows for reflection, thoughtful interaction, and the possibility for refining before posting one's contributions to the discussion (Johnson, 2006; Zembylas & Vrasidas, 2005; Ziegahn, 2005). Throughout the web-based PBL process, person-to-person interaction played a very important role in providing cognitive and affective support for accomplishing learning. With a well-planned, scaffolded PBL approach, students should be able to develop skills of self-directed learning, professional reasoning, and decision-making (Dunlap, 2005; Liu, Hsieh, Cho, & Schallet, 2006). Consequently, the form of text-based, effective communication in an online asynchronous environment is an important issue to consider when encouraging meaningful interaction. The key focus and emphasis of this study was the use of labeled postings to help participants identify the postings they intend to respond to. In the context of asynchronous communication in a web-based learning environment, we explored how students benefited from the use of labeled postings when engaged in through their asynchronous threaded discussions. Students were provided with options for responding to specific topics or specific individuals. Allowing better appreciation of the community in threaded discussions, the use of labeled postings tended to make online conversations focus on the specific views and personality of the individual being responded to.

It has been noted that certain interventions in online discussions appear to influence students' critical thinking and interaction patterns (Peterson-

Lewinson, 2002; Joung, 2004; Spatariu, Quinn, & Hartley, 2007). In our study, students viewed the citation of labeled postings as a self-correction function to help monitor their own learning when reflecting on a specific issue. Due to the specificity of labeled postings cited, students were also able to make corrections accordingly. From our observation, cited postings sometimes triggered a new interest, and group members might switch their discussion to a different focus thread from the initiated one. Students considered this feature important for monitoring their own learning.

The results of our study indicated that labeled postings encouraged extension of a discussion thread. Topics that were threaded to diverge from original topics might also lead to different argumentation or reflection, a situation that commonly occurs in actual social interactions. When a group conversation has reached a turning point, a new interest or reflection can trigger another topic thread for follow-up discussion. Through argumentation and reflection, students using the labeled postings benefited more from being actively involved in threaded discussions. With the specificity and person-to-person contact in the context of asynchronous interaction, the group interaction pattern revealed a more active social presence in a community of inquiry to project each individual socially. This form of social presence seems to support cognitive objectives since it encourages and supports meaningful critical thinking processes in a community of learners (Manca & Delfino, 2007). Students' involvement can result in appealing, engaging, and rewarding group interactions that may lead to an increase in a higher level of thinking in online discussions (Christopher, Thomas, & Talent-Runnels, 2004).

CONCLUSION

This study examined the use of labeled postings in a discussion forum using a web-based setting. Text messages were obtained from the course "Drug and Nutrient Interaction" in the academic years 2004 and 2006. The results of our study indicated that the mean of students' posts increased significantly. Labeled postings also encouraged extension of discussion threads and engaged student participation in both person-to-person and person-to-group interaction. This study indicates that providing options for online text-based discussion modes to accommodate learning needs and to support the learning process is worth considering for effective communication in a web-based environment. From the options provided, learners made their choices of responses based on their communication needs.

In this study, we addressed the use of labeled postings to improve online communication. With the emphasis of identifying each individual's postings, the social presence of each member in the community was recognized. The issue addressed in this study also provides a new vantage point from which to study effective online communication. In a world undergoing dramatic social and technological changes, educators should take advantage of all the ways in which interaction is manifested by individuals, and allow any small innovations to emerge as valuable elements in online learning.

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