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Leslie Albert
San Jose State University, leslie.albert@sjsu.edu

Nitin Aggarwal
San Jose State University, nitin.aggarwal@sjsu.edu

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Nitin Aggarwal, San Jose State University
Leslie J. Albert, San Jose State University

Drs. Aggarwal, Ph.D. and Albert, Ph.D., are assistant professors of Management Information Systems, in the College of Business, San Jose State University.

Abstract
Numerous studies have illustrated the ability of online class discussion forums to support college-level student learning and performance. Yet few instructors incorporate forums into their courses. Many believe that students will fail to find value in or even use class forums or they are concerned about increasing their instructional workloads. Herein we address these concerns via a mixed-methods study of our own students' experiences with class forums.

Introduction
Due to their high-tech upbringings, students of the 'Net Generation learn and process information differently than students of prior generations and they possess equally different views of higher education (Williams & Chinn, 2009; Limbach & Waugh, 2010). For example, the 'Net generation expects learning to be interactive and collaborative with rapid and frequent feedback from peers and instructors (Thomas, 2002). Further, many universities are encouraging the use of technology-based learning tools to engage these students. The challenge to educators then is to create learning environments that meet these learning styles and expectations without sacrificing instructional efficiency (Dawson, Burnett, & O'Donohue, 2006).

Low cost, widely available online discussion forums may offer a means to meeting this challenge. Discussion forums are asynchronous conversation tools where student participants may start new conversations, called as threads, respond to someone else's conversation, called posts, or search for pre-existing conversations, or knowledgebase. Recent research suggests that such online discussions among students are positively related with performance and learning and yet the pedagogical adoption of forums is low (O'Reilly, Rahinel, Foster, & Patterson, 2007; Ajjan & Hartshorne, 2008; Alstete & Beutell, 2004). This may be due instructors' beliefs that students will not actively participate in the forums or will not find them valuable. They may further believe that adding forums to their courses will greatly increase workloads. We address these concerns by reporting on our own students' use and perceived value of forums as class resources and by illustrating how these tools maybe employed with minimal instructor effort.

Background and Relevant Literature
This project focused on class forum use in two sections of the first and second programming courses (four courses total) of an MIS undergraduate program during the fall 2010 semester. Both programming courses employ problem-based learning (PBL) methods in which students learn course concepts and lessons by tackling real world problems that possess many potential solutions (Hmelo-Silver, Duncan, & Chinn, 2007). PBL approaches emphasize collaborative learning, acknowledging the importance of student interactions to learning, and thus are consistent with social learning theories (Alavi, 1994; Hrastinski, 2009). Unfortunately, many factors (e.g. differences in native language, cultural background and personality type) may interfere

19

with students' willingness or ability to participate actively in face-to-face class discussions (Pimpa, 2010; Dineen, 2005; Tatar, 2005). However, research suggests that online discussions forums offset the influence of these factors thereby enabling a greater than additive increase in student-to-student class interactions (Pimpa, 2010; Dineen, 2005; Tatar, 2005; Biesenbach-Lucas, 2003; Schwienhorst, 2004; Kamhi-Stein, 2000). While there is limited evidence of class forums' ability to support PBL specifically (e.g. Chiang & Fung, 2004) we selected forums to support collaborative learning based upon studies which show asynchronous forums do support collaborative, task-based student interactions, higher-level knowledge construction and student performance in programming classes (Schellens &Valcke, 2006; Shaw, 2011). Our student population also played a role in our choice to implement class forums. Many of our students are first generation college students working 20 or more hours per week while attending university full time. Long commutes to campus are also common. As such, our students often struggle to arrange face-to-face meetings with their classmates and instructors outside of class hours. Forums, available 24 hours a day, provide asynchronous collaborative opportunities that fit our students' lifestyles.

Methodology

In our study we employed a mixed method approach that combined an online, anonymous survey (n=128), independently derived usage statics, and a qualitative review of students' posts. The survey was designed to capture students' self-reported frequency of forum use and their perceptions of the value these tools provide in support of their collaborative learning experiences. Usage patterns were also evaluated via passive statics gathered by Google Analytics during the semester. To determine their quality and content, we conducted a qualitative review of student posts throughout the semester and again at the end of the data collection period.

Results: Student Use of Online Forums

We collected evidence of use of online forms from two different sources, Google Analytics and a self-reported survey administered directly to students. Analytics is a free tool provided by Google which helps analyze and track visitors' behavior on a website through cookies on users' computers. Google Analytics provides detailed statistics about website visitors, such as computer capabilities, their physical location, their browsing patterns, and provides a dashboard based overview with capabilities to drill down into specific details of user visits.

Google analytics data for the study semester reveals interesting forum site usage patterns including spikes in the traffic on days on which classes are held as well as on days prior to assignment submission deadlines and exams. During the semester, traffic to the site originated from 23 different countries and 233 different cities. While there is a possibility that some of these visits are accidental or chance occurrences, it is likely that the majority of this traffic was from students travelling to different regions during the semester. For example site traffic during fall break originated from fifty different cities across the United States as compared to previous weeks where the numbers of cities represented were less than forty. Over a four month period during the semester, approximately 120 students visited the class forums 8501 times which is an average of 71 times per student or about 5 times a week. Within California 92% of the visits came from the 10 cities neighboring the university campus. The remaining 8% of the visits came from other California cities. The analytics data also showed that, on average,

students spent six minutes on the website and browsed six pages per visit for a total of 51,000 pages viewed.

In addition to tracking student use of forum on Google Analytics, we administered an anonymous online survey in which students were asked to indicate the frequency with which they read forum posts, posted their own questions to the forum and responded to other students' forum posts. Response categories included: Never, Less than Once a Month, Once a Month, 2-3 Times a Month, Once a Week, 2-3 Times a Week, or Daily. 78% of students self-reported that they read the forums at least once a week and 15% of students referred to the forums daily for information. Further, 30% students posted their own questions to the forums at least once a week and 58% posted several times a month. Likewise almost 20% of the students responded to other students posts several times a week and 46% students respond at least once a week.

The qualitative analysis of actual student posts was conducted to assess the use of discussion forums to support collaborative learning. Although posts included a wide range of topics, such as clarifications about assignment expectations and due dates, discussions around challenging course concepts, and test preparation, the majority of posts were detailed requests for assistance on coding or logical solutions to programming exercises and helpful responses. Interestingly, numerous posts were students' proactive offers to help to their classmates on difficult assignments. These findings are consistent with those of Schellens and Valcke (2006) who found that over 80% student interactions in asynchronous class-based forums are task oriented. Reviews of posts also revealed that most student inquiries received classmate responses on the forum within a satisfactory amount of time (less than two days) without our intervention and that the majority of responses were of high quality. Indeed, many of the student responses provided greater explanatory detail that we would have been able to provide due to time limitations. The few low quality responses posted were quickly corrected by more knowledgeable classmates.

Although a study by Lenhart, Purcell, Smith, & Zickuhr (2010) suggests Web 2.0 technologies, such blogs, are on the decline while the use of more interactive social networking technologies, such as Twitter, are on the rise, our results illustrate that class-based forums are frequently used by students in support of collaborative learning.

Results: Student Perceptions of Online Forum Value
In addition to assessing our students' use of the forums we surveyed them regarding their valuation of this technology as a class resource. Students were asked to indicate their agreement with eight statements on a seven point Likert-type scale with anchors from Strongly Disagree (1) to Strongly Agree (7). Overall, a considerable majority of the students found the forums to be valuable and felt that they helped them get a better grade. Specifically, 93% of the students found the forums to be helpful out of which 27% of the students strongly agreed with this survey item. Approximately 80% of the students believed that the forums provided an effective learning environment and that they were valuable. 25% of these students strongly agreed with this item. It is interesting to note that the students not only found the forums to be valuable, but they also enjoyed reading the forums (80% agreed) with 87% of the students responding that they were glad that the forums were offered as a class resource. The forums also helped improve the students' satisfaction with the class with 70% students validating

21

the statement. To prevent acquiescence, we included some negatively worded questions on the survey. The results of these negatively worded questions were in conformance with the rest of the survey with only 13% of the students responding that the forums did not add any value and 35% of the students responding that they would have done equally well in class without the forums. In summary, survey results indicate that the majority of students found the forums to be an effective and valuable class resource.

Impact of Forum Use on Instructors' Workloads
In addition to questions regarding student use and valuation of online forums, instructors may also have concerns that including forums would greatly increase their course workloads. However, we have not found this to be true. First, using existing forum hosting options such as Ning.com or those found within learning management systems, such as Desire2Learn.com, minimizes initial set-up efforts. Second, instructor participation in online class forums is voluntary and should be kept to a minimum as research suggests high levels of instructor involvement reduces the quantity and frequency of student posts and increases student reliance on instructor provided solutions (Mazzolini & Maddison, 2003; Guldberg & Pilkington, 2007; Andresen, 2009). Occasional instructor posts of encouragement and conversation redirection however, can be beneficial to student learning (Andresen, 2009). In light of these findings, our own participation in class forums was limited to initial set up of primary threads and occasional posts to redirect conversations or address unresolved questions. Third, using forums allows instructors to shift much of the onus of responding to students' questions to their classmates and to address the questions of many students by responding to a single forum post. In our experience, employing class forums has resulted in a large decrease in class-related emails over semesters when forums were not used. Thus, contrary to the expectations of some instructors, the use of class forums may reduce, rather than increase, instructional workloads.

Conclusion and Lessons Learned
Drawing from our own experiences with forums to support collaborative learning we illustrate that these tools are indeed used and perceived as valuable by students and instructors may incorporate forums into their courses without significantly increasing their workloads. In addition we offer following lessons learned from our six semesters of employing class forums. First, the value of forums increases as the number of participants increases – a phenomenon commonly referred to as network effects – thus students should be regularly encouraged to participate in class forums. To maximize participation, we designed each forum to include all sections of a course thereby allowing students from different sections to assist each other. Second, departments seeking integration among sequenced courses should consider enabling student access to forums of prior and future courses. Students in both our first and second semester programming courses have enjoyed sharing notes, help and ideas across these courses. Third, over-censoring of student-created content discourages participation. As such, class forums should be moderated with a light hand or not at all. Fourth, the legibility of forums benefits from an initial organizational structure set up by the instructor around main themes, chapters, and/or assignments. A search function is also improves forum usability. Fifth, periodic review of postings can provide instructors with beneficial insights into class progress as a whole and assistance in identifying topics needing greater in-class discussion. By addressing instructor concerns that may be

22

limiting the pedagogical use of forums we hope that this paper will encourage more instructors to include forums in their pedagogical toolkits.

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