Asynchronous Discussion Groups: A Use-based Taxonomy with Examples
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ABSTRACT

This paper presents a taxonomy of applications for asynchronous discussion groups as used in education. The paper begins by defining common characteristics supported by discussion board technologies: unstructured text, concurrent viewing and contribution, linear or threaded organization, and accessibility on demand. To justify the existence of distinct types of discussion boards, a variety of criteria that have been used for assessing discussion board effectiveness are presented, followed by examples of actual groups that illustrate effective use of the technologies. These examples include an analysis of the key features that distinguish discussion group uses. Based upon this analysis, the taxonomy of such groups is derived, consisting of support, participative discussion, task collaboration, workflow management and administrative. The paper concludes by identifying four prerequisites for effective discussion boards that have been synthesized from the examples and the literature—openness, efficiency, spirit of collaboration and sense of safety—showing how the relative importance of these prerequisites can depend upon the type of discussion board being examined.

Keywords: Discussion Groups, Asynchronous, Distance Learning, Collaborative Discussion, Blended Learning

1. INTRODUCTION

Asynchronous discussion groups are widely-used for providing interactive course content online. The underlying technology occupies a prominent position in existing course management systems (CMS), such as Blackboard and WebCT. It also serves as the backbone for interactive technical support in many high tech companies and as the enabling technology for special-interest Internet newsgroups established for virtually every topic area. In recent years, two new variations of asynchronous technologies, web logs (more commonly referred to as "blogs") and wikis (which allow participants to edit each others entries), have burst upon the national and business scenes (Baker and Green, 2005), becoming an important force in politics and culture, with an estimated 2.1 million active sites in spring 2005 (NITLE Weblog Census, 2005), a number that roughly doubled since 2004 (Nardi *et al.*, 2004). Academic uses of these technologies have already begun to emerge.

As a consequence of their ready availability and widespread voluntary use outside of education, we could reasonably expect uniformly glowing reports relating to discussion group use in education, both supporting the traditional classroom and for distance learning. While such enthusiastic reports certainly exist, we can also find plenty of evidence of disillusionment. Even when the technology is available, many instructors do not take advantage of it (Strauss, 2001). Instructors that do may be disappointed with participation (Smulders, 2004) or by lack of substance in student postings (Hirshheim, 2005). Student satisfaction with such groups is not necessarily high (Ocker and Yaverbauml, 1999). Even some of the "success" stories hardly represent unqualified triumphs. Is a discussion group that attracts two posts per student (on average) over the course of an entire semester (Bollojou and Davison, 2004) successful?

The present paper examines asynchronous discussion groups from a teaching practitioner's perspective. To begin, the paper defines how the term will be used. Research relating to the effective use of discussion groups is then reviewed, followed by the presentation of a series of illustrative case examples. These are then organized into a conceptual framework that forms the basis of a proposed taxonomy for academic discussion group technology uses. The paper concludes by distilling key prerequisites for discussion group effectiveness from the examples and the literature, then relating these to the categories proposed in the taxonomy.

2. DEFINITION

The term "asynchronous discussion group" was originally used to describe public messaging environments that evolved from electronic bulletin board (BBS) forums and Internet newsgroups. Because a proliferation of new web-based technologies supporting asynchronous informational exchanges between individuals has developed over the past 5 years (e.g., web logs and wikis), what could be characterized as an asynchronous discussion group is a moving target. For the purposes of the present paper, the term will be applied to any online technology providing support for the following:

1. Textual entries with few, if any, inherent formatting restrictions. (This is needed to distinguish discussion groups from databases, in general).
2. Concurrent access by a specified or unspecified (public) group of users.
3. Contributions by a specified or unspecified group of users—often referred to as posts or postings—in addition to the initiator of the discussion.
4. Organization of individual contributions into a linear or threaded topology.
   - In a linear topology, contributions are organized by timing, with most recent comments usually—but not always—appearing on top.
   - In a threaded topology, contents are organized into a tree shape according to the topic(s) established in a root posting (the thread) and branches defined by subsequent postings (replies to the root or to subsequent replies).
5. Accessibility on demand (e.g., equivalent to a web page) as opposed to being pushed out to participants (e.g., equivalent to an email distribution list).

Using this definition, technologies such as web logs (blogs) and wikis qualify as "discussion groups"—even though they are substantially different from the traditional threaded discussion tools incorporated into a CMS such as WebCT and Blackboard. In the case of a blog, contributions to a main area are normally limited to the original author and are organized in linear fashion, with most recent entries presented first. What qualifies these as a discussion group technology is the fact that a separate area for reader comments (either linear or threaded) is also normally provided. In the case of a wiki, the main area can be edited by anyone with the appropriate access, with an edit tracking system that keeps a chronological record of revisions. Similar to a blog, a discussion area for comments on the main area is also usually provided. On the other hand, the definition previously specified would not characterize Internet list servers (listservs) as discussion groups—despite the fact that they are often nearly identical to newsgroups, which meet all the criteria, in purpose—since listservs are implemented using a "push" technology (email).

Particularly important for the purposes of the present paper, our focus will be on how asynchronous discussion group technologies can be adapted to different purposes, rather than focusing exclusively on traditional "discussion" uses. This distinction is important because some applications of the technology (e.g., to implement a sign-up sheet, to keep track of student progress) do not require—or benefit from—all 5 defining characteristics. Nonetheless, from the teaching practitioner's perspective, these uses can be quite beneficial.

3. WHAT MAKES A DISCUSSION GROUP EFFECTIVE?

Before presenting specific examples of discussion groups in action, it is useful to ask the question: how do we determine if a particular application of discussion group technology is successful? Certainly, the fundamental issue is clear enough: does the use of the technology benefit the education process? Unfortunately, such benefits can be very difficult to measure and existing tools for measuring overall educational effectiveness—such as student evaluations—are generally not designed to offer tool-specific insights. As a consequence, any measure to be used will, at best, be an approximation. Fortunately, there are many measures that can be acquired. Many of these can be characterized according to a widely used model (DeLone and McLean, 1992) that identifies usage, user satisfaction and individual impact as being among the key criteria for determining IT success.

Perhaps the most critical factor that must first be considered in assessing effectiveness is whether or not participation is voluntary. If it is voluntary, then usage or activity statistics (e.g., Frey and Wojnar, 2004) become important indicators of success. What constitutes an appropriate measurement for usage, however, may be situation-specific. In some circumstances—such as groups used to answer student questions about a course or assignments—access (observation) as well as contribution rates may be important, since students looking for information may find answers to their questions already posted as a reply to another student. Student satisfaction (i.e., user satisfaction) with the groups, if measured, can also be used as an indicator of effectiveness. Finally, measures of educational outcomes (i.e., individual impact), such as test performance, should always be gathered. These can be particularly powerful if they correlate with measures of discussion group usage on a student-by-student basis, since relationship between the different forms of success are expected according to the model (Delone and McLean, 2003).

Where use of a discussion group is not voluntary, usage measures tell us much less since activity will often rise when a group is mandatory and drop when it is voluntary (e.g., Day, *et al.*, 2004; Bhagyavati *et al.*, 2005). For such groups, then, measures of impact on educational outcomes become critical. Such impacts are sometimes grouped into three categories: performance, self-efficacy and satisfaction (Piccoli *et al.*, 2001), where self-efficacy refers to the student's belief that he or she can perform assigned tasks. To measure performance, a detailed analysis of individual student contributions is sometimes used (e.g., Hazari, 2004; Gill, 2005a). Overall discussion performance—across dimensions such as length, breadth, depth and quality—can also be assessed (Benbunan-Fich, 2002). Self-efficacy and satisfaction measures, on the other hand, are frequently measured using student surveys (e.g., Gill, 2005b; Tham and Werner, 2005).

A final category of effectiveness that can be considered is the degree to which a discussion group meets its design objectives—i.e., does it accomplish its intended task? For example, some discussion groups are established to accomplish a very specific function, such as implementing an online signup sheet. For the most part, we can judge the effectiveness of such groups by whether or not they succeed in their intended objective. Design objectives, however, can also include less direct types of contribution to the educational process. For example, even relatively trivial discussion groups—such as the aforementioned signup sheet—may serve an important subsidiary role, such as generating traffic to the site. It could also be that the discussion board is specifically designed to encourage a particular type of learning process, such as learner-centered activities or self-responsibility (Sheard, *et al.*, 2003). In such situations, evidence—either from direct observation or from surveys—that the discussion board is enabling the desired type of learning processes could serve as evidence of effectiveness, even in the absence of direct confirmation from other sources (such as course evaluations). For example, if an instructor's goal is to promote peer-based learning in a course, then survey results finding that discussion board usage was accompanied by an increase in student beliefs that they are learning from their peers would provide support for a conclusion that the use of the technology was effective in achieving course design objectives (e.g., Webb, *et al.*, 2005).

4. SOME "EFFECTIVE" DISCUSSION GROUPS

Using the criteria just presented, we now turn to some examples of discussion groups, considering criteria by which they could be judged "effective".

4.1 Example 1: Online Assignment Support.

In an introductory programming course taught each semester, a separate discussion group was established for each of seven assignments, with Blackboard being used as the course delivery environment. The purpose of the discussions was to supply technical support on the assignments—five of which involved the students writing programs. Because these groups were purely voluntary, usage measures of participation represent important indicators of effectiveness. As illustrated in Figure 1, showing the course discussion area midway through the semester, postings for individual assignments could exceed 100 for a class with between 60 and 70 active students (two assignments, 3 & 5, exceeded 200 postings in fall 2003).

The effectiveness of the groups is further underscored by a breakdown of traffic, summarized in Table 1, which identifies the number of web "hits" per area. To interpret the table, it is useful to know that students—upon logging on—always hit the announcement page (a setting provided by Blackboard), making it a reasonable proxy for entries into the course website itself. Thus, the data suggests roughly one site access per student per day over the first 75 days of the course. The discussion group area of the course represented over 65% of all traffic to the site, as shown in Table 1. Since accessing an individual discussion item represented a single "hit", 10-15 hits per single discussion board session were common. Even discounting by this amount, the average student appeared to be accessing the board roughly every other day.

The effectiveness of these discussion groups can be viewed, in large measure, as a function of the course's unusual design, which was modeled after submarine training (Gill, 2005b). Students in the course were graded entirely on the basis of their performance on seven assignments, according to a pre-established curve given to them at the start of the course (Gill, 2005c). Students were encouraged to collaborate with each other, and were allowed to share code with each other. To ensure the rigor of the process, the last six of the assignments (accounting for 95% of the student's grade) were validated. For two of the pencil and paper assignments, validation was accomplished by computer-generated exams—administered using Blackboard—that they completed in a proctored setting. For another assignment, students were required to recreate the assignment they submitted in a proctored lab. For the remaining assignments, students were required to pass an individual oral exam on the code they handed in—whether the assignment was done individually or as part of a group. Collectively, students viewed these validation exams to be a fair assessment of their knowledge (4.25 out of 5 on the survey).

Area ID	Hits	Percent
Announcements	5596	12.67%
Content Area	5099	11.55%
Discussion Board	29094	65.91%
Gradebook	965	2.18%
Other Areas	3383	7.67%
Total	**44137**	**100%**

Table 1: Breakdown by Content Type

The implications of the assignment/validation design for discussion board participation were profound. Effectively, students could post anything—questions about specific functions, fragments of their code, even links to completed assignments—without fear of violating the course rules. Students trying to take the "easy way" out, by using code that they found on Blackboard or elsewhere, quickly discovered (normally by Assignment 3) that it was virtually impossible to pass an oral exam on high quality code unless they knew the code by heart—just as if they had written it themselves. As a result, Blackboard was most commonly used in precisely the same way that a technical support board might be used by a high tech company—to provide a forum where users could pose questions on how to do something and ask for help when bugs were encountered. Indeed, a secondary design objective of the approach was teaching students how to frame questions in a manner that would allow them to use such support boards in industry.

An interesting postscript to this example occurred in Fall 2004. At that time, the instructor began rescheduling TA office times so that the maximum possible TA coverage of labs (typically 30-40 hours per week) was achieved. With this change, it became much easier for students to drop by the labs or the course office to get assistance. Coinciding with this change was a significant drop in discussion group usage (of over 50%) that persists to the present time. The tentative explanation for this phenomenon, supported by comments in student evaluations, was that increasing the efficiency of one means of support (i.e., TA meetings) will naturally tend to reduce the use of other means (i.e.,

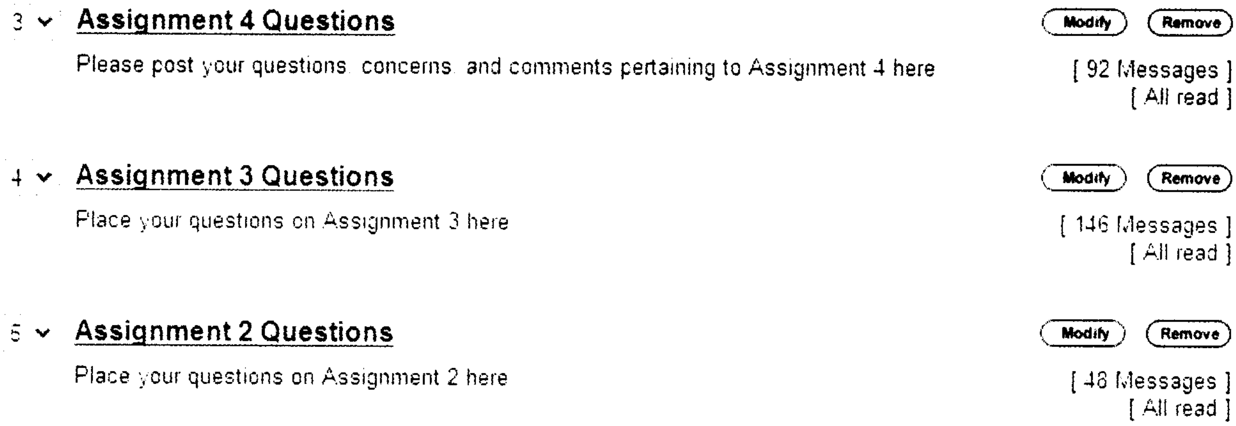

Figure 1: Example Discussion Groups from Programming Course

discussion groups). This interpretation is supported by the fact that the drop in self-reported Blackboard usage—from a mean value of 3.77 hours/week for the previous 5 semesters (N=172) to a mean value of 1.81 hours/week (N=41)—was highly significant ($p<0.01$). On the other hand, the change in self-reported satisfaction with Blackboard over the same period—from a mean value of 4.50 (on a 1 to 5 satisfaction scale, where 5 was very satisfied; N=171) to a mean value of 4.27 (N=41)—was not significant. Indeed, the mean student-reported satisfaction actually rose slightly from that of the previous semester (4.25 in Summer 2004; N=20). Thus, it does not appear that the precipitous drop in usage can be explained as a consequence of student attitudes towards the tool.

4.2. Example 2: Online Case Discussions

A very different example of the use of asynchronous discussion groups can be found in an MBA course, where they were used to discuss MIS case studies (Gill, 2005a; Webb, *et al.* 2005). The use of the tool was not voluntary in this example and discussion participation represented a substantial fraction of each student's course grade.

Because instruction using the case method is normally done in a classroom setting, the instructor needed to adapt the technique for online discussion. Towards this end, the instructor developed a protocol differing from the classroom approach in a number of ways. First, rather than calling upon a single student to "open" the case, 4-5 students were each assigned questions to discuss and were told to open a discussion thread. Second, discussions were conducted over a period of roughly one week, rather than being limited to a single classroom block. Finally, students were divided into random, numbered groups towards the end of each discussion week. Each group then prepared a summary of recommendations and lessons learned, emailed to the instructor. The instructor then graded and posted both the summaries (anonymously, specifying only group numbers) and his detailed comments on each summary. These postings concluded the discussion.

Because participation was non-voluntary, participation measures that were gathered—e.g., a typical 25 person class generated about 90 postings for a single case, the total length of a completed forum ended up being roughly 40 pages of single spaced text—are informative as benchmarks, but are not particularly good indicators of effectiveness. To test effectiveness, then, the instructor gathered survey data from a number of sections where the technique was employed in different mixes of online case discussions and classroom case discussions (5 different MIS MBA sections of the same course were surveyed in this context, over an 18 month period). Four different "treatments" in this quasi-experiment were established, summarized in Table 2 (2 sections had "heavy online" mix of in-class and online cases).

As shown in the table, performance on a difficult (by design) concept grouping test was similar across treatments, as was an overall course assessment question (students were asked if they thought the course would make them a better manager), intended to measure self-efficacy. Course evaluations (not shown), measuring student satisfaction, were also high for all sections (relative to comparable sections of similar courses).

Where statistically different ($p < 0.05$) results did arise across treatments was for two items where students were asked to agree or disagree with statements about the process. As the percentage of online discussions increased, students: 1) increasingly wished the instructor had been more involved, and 2) felt the role of their peers in the learning process was increasing (Webb, *et al.*, 2005). These two process results are particularly relevant because the case method is normally viewed as an approach that should emphasize peer-focused active learning (Barnes, et al, 1994). As a result, the online adaptation of the approach not only represents a successful use of discussion group technology; it also might be viewed as an enhancement of the classroom technique with respect to the peer-focused criterion. This was very much in line with the instructor's design objectives in implementing case discussions online.

Value	1 All in class	2 Light Online	3 Heavy Online	4 All Online
Number of classroom cases	18	11	3	0
Number of online cases	0	4	9.5	10
Mean score on concept grouping test (out of possible 100%)	29.0%	35.3%	41.4%	39.8%
Felt participating in case discussions would make them a better manager*	4.37	4.88	4.82	3.95
Felt they learned more from peers than from professor*	1.47	2.38	3.12	4.25
Felt professor should have been more active in case discussions*	1.37	1.77	2.12	3.9
*Scale: 0=strongly disagree to 6=strongly agree				

Table 2: Selected responses from end-of-class survey (adapted from Gill 2005a)

4.3. Example 3: Debates in MIS
A course titled "Enterprise Information Systems Management" course was offered as the capstone course in a MS in MIS program. A significant (33%) percentage of each student's grade in the course was the result of his or her participation in a series of debates on topics of current MIS interest (e.g., "Resolved: Within 10 years economics will dictate that nearly all routine programming in the U.S. will be outsourced to countries such as India, China and Russia"). Each week, a different topic was debated and about 25-33% of the class was selected to be part of the debate participant group, either on the pro side, con side or as moderator. Students were allowed to identify topics that they are interested in debating, but are given no choice of role (i.e., pro, con, moderator), which was assigned at random.

For the debate activity, use of discussion groups was required as part of the preparation process. At least a week prior to each debate, the moderator was required to post a "briefing paper", 2-3 pages in length, that summarizes the debate. The paper served two purposes. First, all students in the class are required to read it (and a 5-6 question multiple choice quiz on the contents of the paper was administered—using eInstruction electronic response pads—immediately prior to the start of the debate). Second, the briefing paper provided a starting point for the pro and con teams, each of whom had to post all references acquired during their research to the discussion group. This created a very open process of debate preparation, since both sides knew what factual materials the other side was using to prepare.

As a very task-focused use of discussion groups, effectiveness can be viewed largely in terms of satisfactory completion of the task, which revolved around group collaboration. (For benchmark purposes, in fall semester 2003 the median debate discussion consisted of 26 student postings plus 3 instructor postings). Overall, students rated the debate exercise as 4.2 on a scale of 1 to 5 (where a score of 5 was most beneficial to learning).

4.4. Example 4: Strategic Systems Project
Also incorporated in the "Enterprise Information Systems Management" course described in Example 3, the strategic systems project was a multi-semester project in which students compiled detailed histories of the many information systems identified as being "strategic" during the period from the late 1970s to early 1990s. The objective of the project was to compile a document on each system that included a comprehensive set of references, along with follow-up analysis relating to the impact that these systems had on their organizations. Ultimately, the completed write ups were to be placed in an online database that would be made available to MIS researchers. Prior to commencing the project, students were given a 60 minute training session on library research methods, conducted by the university's library staff.

Because well over 100 MIS systems were labeled "strategic" according to the research sources of the day, the project (which began in fall semester 2003) was designed to run across multiple semesters, through the fall semester of 2006. Each student was assigned 2 systems to investigate, and each system was replicated at least once, depending on the degree to which analyses by different students converged. As was the case for Example 3, the project represented 1/3 of the student's grade (the remaining 1/3 being awarded for participation in classroom case discussions).

The discussion groups used in the project served primarily for workflow control, archival storage, and monitoring. For the first two semesters of the project, at the beginning of each semester the name of each system was posted as a separate thread. Students then signed up for a system by replying to the thread, on a first come, first served basis. Thereafter, they were required to post all significant references that they found relating to the system, either as web links or as journal references. This process typically led to 5-10 postings per student, some of which contained multiple references. These references were then used by students in later semesters, when it came time to consolidate all the reports on a given system.

Because few students in the class were particularly interested in systems beyond those assigned to them, the discussion group technology use in this context did not really constitute "discussion". Rather, it provided: 1) a convenient mechanism for disseminating information about previous research to students, 2) a repository for information that needed to be repackaged for use in subsequent semesters, and, most importantly, 3) a tool by which the instructor and teaching assistants could monitor student efforts—allowing them to identify and "encourage" students who appeared to be procrastinating on their work. Because it was effective in all three of these roles—each of which represents a form of performance metric according to the effectiveness framework presented earlier—it can be concluded to be an effective use of discussion groups.

The success of the technology in logging research was not unqualified, however. Setting up the discussion with separate threads for each system at the start of each semester took several hours. During the semester, the discussions grew unwieldy in size, as postings on each system accumulated. The mix of systems in the board also made the archiving process tedious, and it was hard to search and consolidate results. For this reason, the instructor continued to examine alternative approaches.

In fall 2004, web log (blog) technology replaced discussion groups for the purpose of maintaining individual research logs. The instructor accessed these logs periodically using techniques described in Example 5. Recording research activities in a web log proved to be easier for both students and the instructor. The transition to blogs was also accompanied by a significant improvement in instructor evaluations (from 4.4 in spring 2004 to 5.0 in fall 2004 on a 1 to 5 scale, with 5 being "Excellent"), although other factors (e.g., smaller class size, variability between students in each class) doubtless impacted these scores as well.

4.5. Example 5: Student activity monitoring

By mid 2004, the programming course described in Example 1 was organized into an entirely self-paced format. When due dates were first eliminated in the summer semester of 2004, a serious problem with student workload self-management was encountered. Based upon grade information, students attempted to complete roughly 80% of all course material during the last 10 days of a 10 week semester. Remarkably, the course was successful from the standpoint that it had the lowest DWF (D-grade, withdrawal and failure) rate experienced in 2 years. Unfortunately, students also ended up with an inordinately large number of C grades (76% of all passing grades). To combat this problem, the instructor instituted a weekly check-in policy whereby students received participation credit for either filling in an online form or making an entry to a web log (hosted using free LiveJournal accounts).

Web logs proved to be a particularly efficient means of tracking student behavior. They had three advantages over threaded discussion groups (such as those used for a similar purpose in Example 4). First, since there was normally no need for threading when students described their own activities, the linear web log structure was a more natural fit. Second, web logs came with a greater sense of privacy—since a student would need to know another student's ID in order to access his or her log. Third, it was easier to access web logs on demand, using the XML-based RSS feed that is provided by most hosting sites. There were two alternative ways of achieving access:

- Using a free RSS reader, such as Pluck, that maintains a list of favorite feeds that are accessed using an interface similar to MS-Outlook's summary window.
- Programmatically, using a tool (e.g., MS Visual Studio .NET) that offers built-in functionality for accessing and manipulating Internet-based XML data streams.

The instructor chose the programmatic approach, building an application that consolidated RSS feed, web form and grade information. The program also prepared a weekly progress report that was sent to each student by email (see Figure 2 for a section of an actual report, with identifying information removed). By the end of the semester, these reports had grown to 10-15 pages long for many students, and ensured that each student was aware that the course staff was cognizant of their activities.

The observed outcome of monitoring student progress—a performance metric, according to the effectiveness criteria—was dramatic. Whereas the distributions of A's, B's and C's in the summer was 0%-24%-76%, in the fall semester—with precisely the same assignment structure—the A-B-C distribution had improved to 44%30%-26%. Teaching assistants in the course also observed that students were seeking help and completing work much earlier in the semester.

4.6. Example 6: Oral Exam Signup Sheet

In Example 1, it was noted that oral examinations served as a critical source of validation for students in that programming course. Organizing these exams, however, was a complex task because many students chose not to attend lectures and therefore could not sign up for exam time slots with the instructor or teaching assistants. To address this, an online discussion group was established with threads identifying available time slots that students can reply to in order to "claim" an interview time.

Typically, the TA times slots were posted anonymously, making it difficult (though not impossible) for a student to sign up with his or her favorite TA. The instructor's times were listed under his name—necessary because all oral exam retakes needed to be administered by him, as well as exams with any students who had an interest in becoming future TAs. For this use, effectiveness is purely a matter of meeting the design objective of ensuring meetings are scheduled. In spring 2006, the signup process was migrated to a wiki format (see Example 7), which reduced instructor and TA setup time.

4.7. Example 7: Strategic System Signup Sheet

As noted in Example 4, students needed to choose the systems that they were to research. In the past, this was accomplished in two different ways. The initial approach to implementing signups, as previously noted, was to create a discussion board with each system being given a separate thread. Students then "claimed" a system by being the first to reply to that thread and then used the thread to post their research findings. Also as previously noted, although the system worked it was time consuming to set up and unwieldy in its outcome.

Journal of Q Public

Title:	My chance...
Date:	11/2/2004 9:11:39 PM
Description:	OK....I have a lull for a couple of weeks. I plan to validate four, finish five (have about half done so far), start 6... Hopefully. I have been out-of-control busy for the last couple weeks. Hopefully I can now focus on this class!
http://www.livejournal.com/users/jQPublic/2351.html	

Title:	
Date:	10/27/2004 10:34:50 AM
Description:	I am doing fine. I have completed the fourth assignment and plan to validate it next week. I have started the 5th assignment and done the first 5 questions. Hopefully I will get it done in the next couple of weeks (or sooner). I believe I'm on track.
http://www.livejournal.com/users/jQPublic/2200.html	

Title:	Another entry
Date:	10/19/2004 10:58:38 PM
Description:	Everything is going fine. I have been fairly swamped in my other classes so I have not done much for this one. I have got most of project 4 done...hopefully finish it up by next week. I also got application project 3 validated. That was fun.
http://www.livejournal.com/users/jQPublic/2010.html	

Title:	Not much done this week...
Date:	10/6/2004 10:54:28 PM
Description:	I have been swamped. Two tests, two papers, and a quiz in three days! Needless to say, I have not done much programming this week. Hopefully, I will start the fourth project tomorrow. It doesn't look too bad, so maybe I can have it done by the first of next week. I'll give it he[ck]. HA.
http://www.livejournal.com/users/jQPublic/1543.html	

Figure 2: Section of student web log for programming course

With the initiation of blog-based research logs, in fall 2004, the signup process was simplified. Instead of an online signup, the instructor passed around a sign-up sheet in class, consisting of the names of all available systems. There were two drawbacks to this approach. First, students were distracted from the class when then list reached them. Second, students could not look up the system to find out more about it prior to selecting it.

In fall 2005, a wiki-based signup sheet was substituted for the paper and discussion group approaches. The resulting setup time was identical to that of the paper-based solution, while its effectiveness rivaled (or exceeded) the discussion group approach, owing to the ease of incorporating additional information on each system (see Figure 3). While this example—much like the previous one—might seem rather trivial, both illustrate how discussion technologies can be used for administrative purposes—with effectiveness demonstrated solely by meeting a design goal, such as improved efficiency. As a subsidiary benefit, both also served to build traffic to areas where more course-specific content resided.

5. A USE-BASED TAXONOMY OF DISCUSSION GROUPS

The uses of discussion group technology that were presented in the previous section are summarized in Table 3, organized by use categories that have been induced from the examples. This type of breakdown bears some resemblance to breakdowns by content type proposed in the literature (e.g., Blignaut and Trollip, 2003). This taxonomy differs, however, in three ways. First, the specific categories proposed differ significantly, with the earlier taxonomy focusing on the characterizing the nature of individual interactions occurring within a thread (e.g., Socratic, corrective, informative). Second, the earlier taxonomy emphasized emergent interactions, rather than design goals. Finally, current taxonomy anticipates that different forms of content will tend to be the focus of different groups, based on the examples presented. This is a distinct change from the earlier taxonomy, which held that all content would be mixed in a single group, and that characterization at the individual post level was therefore required.

In looking at the fourth column of Table 3, it is evident that the first two uses—support and participative discussion—are what could be termed design uses of the technology. What this means is that asynchronous discussion groups tend to be the tool of choice to support these activities in the "real world", even when other technologies are available. The last two categories, on the other hand, are what might be referred to as convenience uses, meaning that discussion group technologies may be adequate for the purpose even though better technologies (e.g., use of project management software for coordinating project tasks, use of a public calendar for making appointments) are available. In the case of the third category, task collaboration, it can be argued that Wikipedia represents a design variation on asynchronous discussion technology specifically supporting collaboration, whereas group decision support systems (GDSS) rightfully belong in a different category. The distinction here probably relates to the degree a technology is intended to support asynchronous (e.g., Wikipedia) vs. synchronous (e.g., GDSS, chat) collaborations. For asynchronous collaborations, discussion board technology variations may be the "best" solution currently available. Where synchronous collaboration is desired, in contrast, their use would be dictated by reasons of convenience (if at all). Interestingly, as noted in the examples, the wiki-style discussion board also exhibits considerable potential for supporting many administrative (category 5) activities, such as signup sheets.

6. DISCUSSION

An important theme that runs through the examples is that increasing discussion group effectiveness may require changes to classroom processes and course design. In particular, the examples and the literature identify four qualities that seem to be common prerequisites for effective discussion group use: openness, efficiency, spirit of collaboration and sense of safety. The importance of these will, to a great extent, depend on the specific category of discussion board activity being considered.

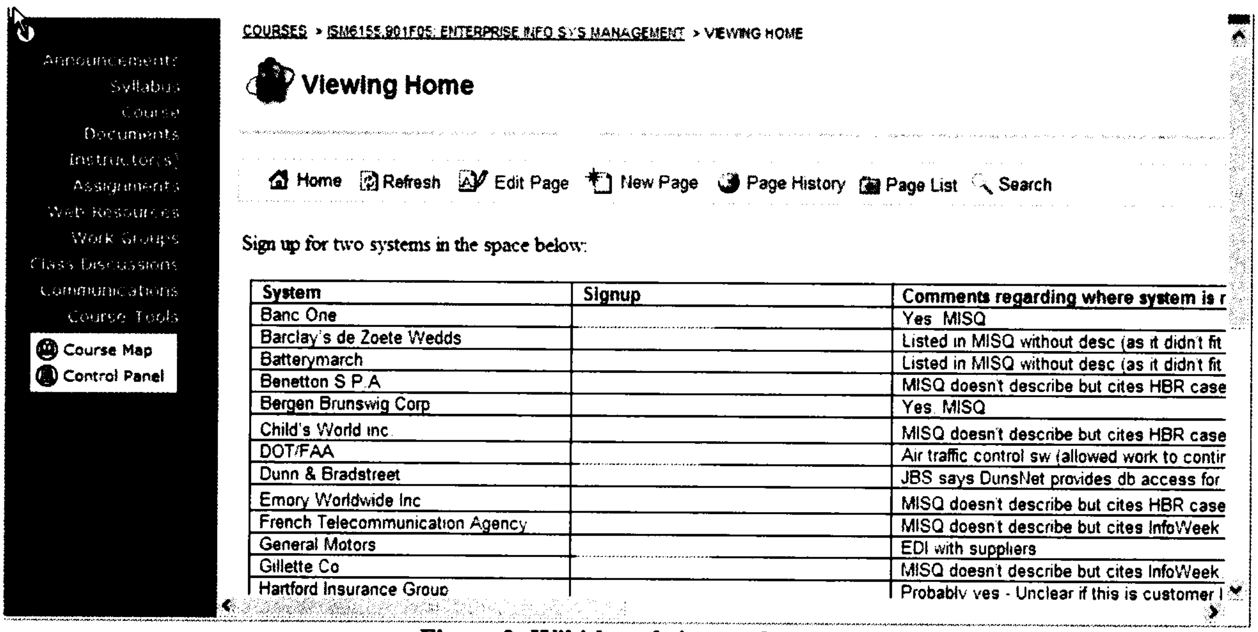

Figure 3: Wiki-based signup sheet

Category	Description of Discussion Group	Effectiveness Criteria	Examples
1. Support	Provided to answer questions in a public forum. Can be general (e.g., "General Questions") or focused (e.g., "Assignment 3") in nature. Provides efficient alternative to two-way communications, such as e-mail or phone. Nearly always voluntary, may or may not be moderated.	**Primary:** Usage **Secondary:** Performance Satisfaction Self-Efficacy Design Objectives	*Example 1* *Vendor tech support* *Newbie newsgroups*
2. Participative Discussion	Provided to host a discussion, usually on a focused topic. Can be graded (in an academic setting) or established as a way of discussing common interests. Where quality is of concern, will typically be moderated.	**Primary:** Performance **Secondary:** Satisfaction Self-Efficacy Design Objectives Usage (only if voluntary)	*Example 2* *Internet newsgroups*
3. Task Collaboration	Provided to assist groups collaborating on a particular task. Public discussion groups often provide a convenient workspace, but may also be incorporated into a private group area.		*Example 3* *GDSS applications* *Wikipedia*
4. Workflow Management	Provided to allow assignment and tracking of workflow.	**Primary:** Performance Design Objectives	*Examples 4 & 5* *Project software*
5. Administrative	Provided to accomplish administrative tasks, such as scheduling and assignments.	**Primary:** Design Objectives	*Example 6* *Example 7* *MS Exchange*

Table 3: Activities Performed Using Asynchronous Discussion Groups

6.1. Openness

If students are to participate in discussion groups voluntarily, they need to feel that there are few, if any, constraints on what they can post. Lack of openness has been cited as a serious barrier to discussion board participation (Chatterjea, 2004). Achieving openness, however, may require rethinking traditional course practices—particularly with respect to collaboration. As an example, in the programming course (Example 1), students are allowed to post complete functions (i.e., answers to assignment questions) in their attempts to elicit feedback. Allowing such openness without loss of rigor required many changes to the course design, most notably the implementation of the assignment validation system. These policies were in sharp contrast to those of many introductory programming courses (including those offered by computer science at the instructor's institution), where students were not allowed to collaborate with each other on assignments and were sometimes even required to sign affidavits to the effect that they were handing in their own work. In such a constrained environment, it is hard to see what a student could possibly ask that would constitute a "legal" question on a discussion board. Moreover, there would be absolutely no motivation to read anyone else's postings. This is not to say that such a restrictive course design is necessarily bad. It simply means that instructor-hosted discussion groups aren't like to generate much traffic with such a set of ground rules.

With respect to the five discussion group categories, openness seems particularly relevant to those where usage and performance are principal objectives (i.e., support, participative discussion, and task collaboration). The examples provide little evidence that process monitoring or administrative uses are similarly dependent on the perception that groups are open to a variety of postings and/or points of view. Indeed, blog technology may be preferable to threaded discussions for situations where "open" exchange of information isn't really necessary (e.g., in Examples 4 and 5).

6.2. Efficiency

Particularly when participation is not mandated, the effectiveness of a discussion group—measured in terms of usage—is likely to be greatly enhanced when it is viewed as the most efficient means of acquiring needed support. Such a perception is built up in two ways. First, replies to posts need to come rapidly. During 2002, for example, the median response time for student questions in the Example 1 programming course was just under an hour. Second, the efficiency of acquiring information by other means should be reduced. For example, if a student sends a question by e-mail, the instructor can post it to the discussion group (along with the answer), then inform the student where to look for the answer. Such a practice dramatically reduces subsequent e-mails. The sharp drop in per student activity on the discussion boards that accompanied increased TA availability in Example 1 further demonstrates the role efficiency can play in determining levels of usage.

With respect to the five discussion group categories, efficiency seems particularly relevant to voluntary boards in general and administrative uses. Other categories of discussion may succeed, in fact, despite seeming somewhat inefficient to users. For example, participative discussion, as presented in Example 2, can be quite tedious to grade (Gill, 2005a) from the instructor's perspective. Similarly, students may not perceive efficiency benefits from postings made solely for the purpose of progress monitoring, as discussed in Examples 4 and 5.

6.3. Spirit of Collaboration

A sense that one's contribution to the "pool of knowledge" will not put the individual at a disadvantage can be critical if some discussion groups are to succeed. This means that significant course redesign may be required in situations where students feel they are competing with each other. For instance, the debate exercise discussions (Example 3) would likely change dramatically for the worse if the instructor started to announce a winner for each debate. Instead, great care was taken to emphasize that such debates are graded purely on basis of the quality of the classroom interaction that they generated, and on the amount of useful knowledge that they provided to the non-participants.
Even with guarantees to students that they are not in competition with their peers, there may be some students who are uncomfortable with such collaboration. In a typical semester, the instructor of the programming course (Example 1) received several e-mails from students asking questions about code they had written, despite his strongly stated preference that such requests be posted to Blackboard. In these cases, the student invariably justified the use of email by stating that he or she had spent a great deal of time on writing the code, and does not want others using it. Fortunately—in terms of the amount of email traffic the instructor needed to answer—relatively few students felt that particular sense of protectiveness about their intellectual property.

Encouragement of collaboration is, obviously, critical for task collaboration activities (Category 3) and is also likely to be valuable in support activities—where having students answering each other posts can dramatically increase the effectiveness of the discussion. It is not clear that it is normally a prerequisite to effective process monitoring or administrative uses. The most interesting category in this regard is, perhaps, participative discussions. While clearly a group activity, such discussions are not necessarily collaborative in spirit because students are often, in effect, competing with each other to make the best points. One of the interesting aspects of the protocol used for Example 2 case discussions (Gill, 2005a; Webb, *et al.* 2005) was that it specifically required collaboration at the end of each discussion by randomly assigning students to groups that were each then required to submit a single summary of the case.

6.4. Sense of safety

To achieve voluntary use of discussion groups, students need to have confidence that they will not be adversely affected by their participation. In the Example 1 support discussion, this was accomplished in three ways: 1) by assuring students that they would not be hurt by anything they posted (within the limits of civil behavior), 2) by making sure that replies to all posts were as respectful and helpful as possible—no matter how badly the initial post violated the laws of common sense, and 3) by allowing anonymous postings. The last of these can become quite frustrating, since the context of the question (e.g., previous questions that the same student may have asked) cannot be determined if many students post anonymously. Nonetheless, experience suggests that some students will never post voluntarily unless they can do so anonymously. Thus, while such postings can be discouraged, they should not be prohibited.
With respect to the five discussion group categories, sense of safety—similar to efficiency and openness—is critical for any voluntary discussion. It also tends to be important for any usage category (e.g., task collaboration, participative discussion, workflow management) where performance is a key objective. If students do not feel they can trust the instructor, it is doubtful that their reports (e.g., Examples 4 and 5) will accurately reflect their progress (Category 4) during periods when they are being hampered by problems not related to the course—which is precisely the sort of information that the instructor needs to know when trying to decide how to help students move forward. If students don't feel safe, it is also likely that they will avoid taking any risks in their contributions to collaborative or participative discussion activities (Categories 2 and 3)—with fewer insights being likely to surface as a result.

7. CONCLUSIONS

Discussion groups can be extremely effective in enabling learning. The examples presented here demonstrate various ways in which these groups can contribute to student performance, self-efficacy and satisfaction. They can also be used to meet a variety of course design objectives. These can range from mundane tasks, such as scheduling, to far more pedagogically significant objectives, such as increasing peer-to-peer interaction.

The gains in learning made possible by the technology do not come for free. "If you build it they will come" (Edelstein and Edwards, 2002) is a romantic ideal, and makes for a good movie plot, but it does not apply to discussion groups. Substantial course redesign may be required, because openness, collaboration and sense of safety must be present for many categories of discussion to be effective. And if such groups are not perceived to be the most efficient way for students to get the content they need and the feedback they desire, voluntary discussions will typically be ignored.

Instructors also need to be aware of the demands that using such groups will place upon them and their students. If the instructor is unable or unwilling to meet these demands—be they time requirements or the need to abandon long-standing course procedures in order to create an environment where such discussions can thrive—then perhaps it is best to stick with the classroom. Employed creatively, however, a properly designed discussion group offers the potential to promote collaboration, to achieve efficiencies in mundane tasks and to enable forms of learning that are difficult to attain in a pure classroom setting. For these reasons, faculty who are serious about the practice of their teaching craft can benefit greatly from a deeper understanding of these technologies and the ways in which they can be used.

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