USING ASYNCHRONOUS DISCUSSION BOARDS TO TEACH IS: REFLECTIONS FROM PRACTICE

Completed Research Paper

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Abstract

This study explores how student learning via asynchronous, threaded discussion boards may be managed successful. We examine the elements of course scaffolding on that affect student learning and engagement in discussion. We explore the role of the instructor in mediating learning. We base our findings on an analysis of 21 online courses in the IS domain, conducted by multiple instructors over a period of eight years. Our findings indicate that three aspects of course scaffolding impact learning outcomes: question structure, question focus, and the design of supporting materials. We also deconstruct the myth of the entertaining professor , concluding that, while students are more satisfied with courses where the professor is deemed to be entertaining – and thus more motivated to learn - this form of course mediation may actually impede deep learning.

Keywords: IS education, Social networks, Collaboration

Structures Required By a Social Network of Inquiry

Social Networks and Interactions

Student engagement with asynchronous courses occurs when students make a psychological investment in learning. An online course may be viewed as a community of inquiry when a deep and meaningful (collaborative-constructivist) learning experience is achieved through the development of three interdependent elements: cognitive presence, indicated by the ability of learners to construct meaning from course interactions, teaching presence, indicated by the degree a course provides structure and process for learning, and social presence, indicated by the degree to which learners project their identity and personal characteristics into communal learning (Garrison et al. 2001). Much of the online learning literature argues that students must commit to all three aspects of a course environment, to engage fully with socially-situated learning (e.g. Akyol and Garrison 2010; Shields 2003). However, a preference for engaging in, or avoiding social interaction has been argued to be a core element of students' learning style – as significant as the preference for text vs. graphical course materials (Beyth-Marom et al. 2005). A primary reason for enrollment in an asynchronous course is that it avoids the need for social interactions, permitting the student to work when they want, how they want. That does not mean that there is no social learning. Vicarious learning may provide an excellent substitute for learning from peer interactions (Stenning et al. 1999; Waters and Gasson 2006). This understanding develops the argument that asynchronous learning groups do not so much constitute a community of inquiry, but rather a network of inquiry, where individuals are connected through a web of social relationships, some of which may be strong and some weak. Brown & Duguid (2001) argue that communities of practice present a special case of networks of practice, as a stable group of individuals with strong social ties engage in a shared practice. In networks of practice, as individuals adopt different roles and behaviors, they move in and out of the network. This is the model that we espouse for asynchronous learning networks: individuals adopt contingent roles and behaviors that move them in and out of the social focus which the network brings to an online course.

The asynchronous threaded discussion board is a staple tool of the majority of learning management systems. Threaded discussions support active, constructivist learning as students debate the meaning and applications of course concepts over multiple interactions (Bonk and Dennen 2007). They also permit vicarious learning: observation of an interactive debate may be as effective as actual participation in the debate itself (Cox et al. 1999; Dineen et al. 1999; Lee et al. 1999; Stenning et al. 1999). Discussion boards (*a.k.a.* forums and groups) can serve social, cognitive and pedagogical purposes in learning, as they allow concepts to be explored, contested and agreed across a peer-network of students (Anderson and Elloumi 2004). The social function of discussion provides a vital precursor to its cognitive and pedagogical functions (Rourke et al. 2001). Encouraging students to identify with their peers and to engage in peer-peer interactions is a fundamental part of achieving constructivist learning in asynchronous environments.

There are two major pedagogical benefits of asynchronous discussion tools over synchronous (real-time) chat systems in online learning. The first relates to deep learning where "material is embraced and digested in the search for meaning"(Garrison and Cleveland-Innes 2005). Asynchronous, threaded discussions allow students to engage in deep learning because of the socially-situated process by which they engage in debate with peers and instructors. Social and academic interaction have a demonstrated impact on achieving deep learning outcomes (Cleveland-Innes and Emes 2005). Asynchronous discussions allow students to puzzle over concepts and to reflect carefully before making their own contributions (English and Yazadani 1999; Lipponen 2001). But the isolated mode of participation, coupled with the structural organization of messages, which can cause discussions to branch endlessly, may preclude the peer-interactions required for constructivist learning. The instructor role is central to mediating this effect (Thomas 2002). The instructor must provide not only the bulk of the pedagogical presence (Garrison et al. 2001) but carefully monitor and nudge discussion when it threatens to veer off course or descend into ad hominem attacks (Clark 1998). The instructor must set the scene, with appropriate topics and questions for discussion, but careful facilitation is required to shape and guide debate. The instructor plays a key role in promoting the social presence required for online engagement (Rourke et al. 2001). The role of instructor-as-mediator is critical to deep learning outcomes – without

effective social mediation, student involvement in asynchronous learning degenerates into token participation (Garrison and Cleveland-Innes 2005). Effective instructor mediation of asynchronous course interactions is essential to promoting student enjoyment and motivation to learn (Wu and Hiltz 2004). This understanding promotes a general perception that the instructor must be entertaining in order to provide the social conditions for and to motivate students to learn. But the forms of instructor mediation that engender deep learning by students are not so well understood.

Course Scaffolding

Of course, the social network is not the only aspect of an asynchronous learning environment. We must also consider the ways in which the course is scaffolded (Rogoff 1990). In the same way that a scaffold provides a structure on which builders can climb as they construct successive levels of a house, scaffolding for online learners provides access to successive levels of content, allowing learners to place that content within a structure and process for learning (Akyol and Garrison 2010). Studies of various asynchronous learning environments have concluded that defining information structures in the design of course scaffolding is central to effective learning outcomes (Salomon and Perkins 1998; Sims et al. 2002; Soloway et al. 1996). Scaffolding, in the form of task authenticity, provides learners with analogues of real world problems that may be highly motivating, as well as leading to deep learning outcomes (Järvelä et al. 2004). But there has been little research into what makes an effective scaffold for various *types* of course. We understand the need for structure, such as procedural guides, templates and worked examples as well as FAQs and knowledge databases (van Aalst and Chan 2001) but know little about the types of structure that are most effective on a domain by domain basis. In the more abstract knowledge domains, merely asking 'focusing' questions can be less effective than scripting interventions (Weinberger et al. 2002). However, we have little evidence of what works in scaffolding domains such as Information Systems, that deal with professional skills, domain-sensitization, and context-specific knowledge.

Evaluating Deep-Learning Outcomes in Social Networks of Inquiry

Ascertaining the quality of online interactions in asynchronous learning environments is far from trivial. For many online discussions we lack a concrete set of outcomes. We may not have an end-product such as a report or a design, in other words there may be no single artifact that embodies collaborative learning or problem-solving other than the discussion itself (Stahl 2006). How then might we assess the quality of interactions in an online course? At an overview level, there are a number of commonly used criteria to analyze patterns of interaction, such as the number of messages in a discussion thread, maximum depth of a thread, and the number of different participants in a thread (Harasim 1989; Kumari 2001; Morris and Naughton 1999; Picciano 2002). The modes of interaction are evaluated most effectively by analyzing message contents (Garrison 2003; Waters and Gasson 2006). We can examine the number of unique thematic units - a single unit of meaning that contains a single logically coherent idea or a complete chain of argument or concept - (Henri 1991) as a measure of how many ideas are spawned in a discussion.

Table 1. Evaluation Framework For Asynchronous Collaborative Learning

	Element	Evaluation
Instructor Moderation	Instructor role in shaping, guiding and mediating course learning	Identifying the impact of pedagogical, social, and moderating behaviors
Social Networks of Inquiry	The role of student interactions in achieving deep learning	Evaluating the structures and content of interaction: peer-peer & instructor-student
Course Scaffolding	Informational and cognitive structures embedded in learning processes and materials	Analyzing the quality of topic framing and elaboration by students, as a result of encountering these structures.

Following the review of concepts above, our research question explored how we may provide the conditions for deep learning outcomes in asynchronous online course environments, for courses focused on the Information Systems domain. We based our analysis on the conceptual framework presented in Table 1.

Research Method

From 2004 to 2012 we collected transcript data from the Blackboard discussion boards of 21 online, graduate-level degree courses at a North American university, with an average enrollment of 22 students. Each course was of 10 weeks duration and each week, between 1 and 4 questions were posted by the instructor for student discussion. Students were required to post a minimum of 1 substantive response to the discussion board per week, although grading schema varied (as discussed below). The volume of messages posted for individual courses was highly variable, ranging from 356 to 2745 over the same time span. The discussion board transcripts for each course were analyzed separately. For each course the transcripts were divided out by course week number (1 thru 10) and by the questions posted for that week. Each question posted had a lifespan of exactly one calendar week (Monday thru Sunday). The level of instructor participation in the discussions ranged from merely setting the questions to measured periodic responses to frankly intrusive (more later). Student levels of interaction ranged from less than 1 message per month to more than 20 messages per week. The transcripts were coded for content, using a grounded classification framework which categorizes message segments according to the types of social and/or cognitive online presence behaviors that they contain. This scheme was derived over successive studies, to identify content that indicates deep learning, such as elaboration of topics initiated by others, complication of the discussion around a topic, or topic synthesis (Gasson and Waters forthcoming).

We analyzed the structural properties of discussion posts to explore patterns of interaction and debate. For each question posted we could measure the raw number of answering posts from each participant, the number of participants answering a question, the sender and receiver of messages posted, the length of each message and the pattern of replies over time. On an aggregate level this provided some basic clues. More interestingly we could examine how discussion branched at certain points leading to independent deepening sub threads where different elements of a problem were focused upon more closely. Each explicit "reply to this post" action was flagged by the system by indentation of the message details in the outline as in the segment shown in Figure 1:

RE: Sys Analysts **S15** 1/9/08 1:48 AM
RE: Sys Analysts **Instructor** 1/9/08 10:00 AM
RE: Sys Analysts **S10** 1/9/08 10:02 AM
RE: Sys Analysts **Instructor** 1/9/08 10:31 AM
RE: Sys Analysts **S14** 1/9/08 1:30 PM
RE: Sys Analysts **Instructor** 1/9/08 2:08 PM
RE: Sys Analysts **S21** 1/9/08 2:20 PM
RE: Sys Analysts **S5** 1/9/08 3:22 PM
RE: Sys Analysts **S10** 1/9/08 3:13 PM
RE: Sys Analysts **S14** 1/9/08 3:41 PM
RE: Sys Analysts **Instructor** 1/9/08 5:29 PM
RE: Sys Analysts **S14** 1/9/08 5:50 PM
RE: Sys Analysts **S20** 1/9/08 6:47 PM
RE: Sys Analysts **S22** 1/12/08 7:15 PM
RE: Sys Analysts **S5** 1/9/08 7:38 PM
RE: Sys Analysts **S2** 1/9/08 7:54 PM
RE: Sys Analysts **S5** 1/9/08 8:12 PM
RE: Sys Analysts **S22** 1/12/08 7:13 PM
RE: Sys Analysts **S24** 1/9/08 6:45 PM
RE: Sys Analysts **Instructor** 1/10/08 3:17 PM

Figure 1. Discussion Thread Branches, Indicating Engagement in Different Sub-Debates

From such visualization we could tell who was the most (and least) responded to, whose posts started the deepest and longest sub threads and on a question by question basis which topics/questions sparked the liveliest debate. Of course it was also necessary to examine the content of messages to ensure we were not seeing a host of nested "I agree with Fred" or "LOL Cats!" messages (which did not count towards measures of interactive learning). We could also see at a glance the effect of instructor intervention, which

we discuss below. The structural analysis, combined with some content analysis allowed us to analyze the social networks of interaction between participants.

Finally, we employed surveys across multiple courses to explore student perspectives of the impact of the discussion behaviors and scaffolding factors that we unearthed. Findings from our content analysis have been presented elsewhere [Reference Anonymized] and are ongoing. In this paper we present findings on the effects of various forms of course scaffolding and instructor mediation.

Findings

Effective Discussion Scaffolding

Effects of Discussion Grading Rubric on Discussion Participation

In courses where general guidelines were set for discussion, such as "be courteous" and "respond to each weekly topic," we typically encountered a brontosaurus-shaped activity curve (activity starts slowly, peaks in weeks 6-7, then declines as final deadlines approach) shown in the left-hand graph of Figure 1. With a more structured grading scheme, a different pattern of activity was discerned, as shown in the right-hand graph of Figure 2.

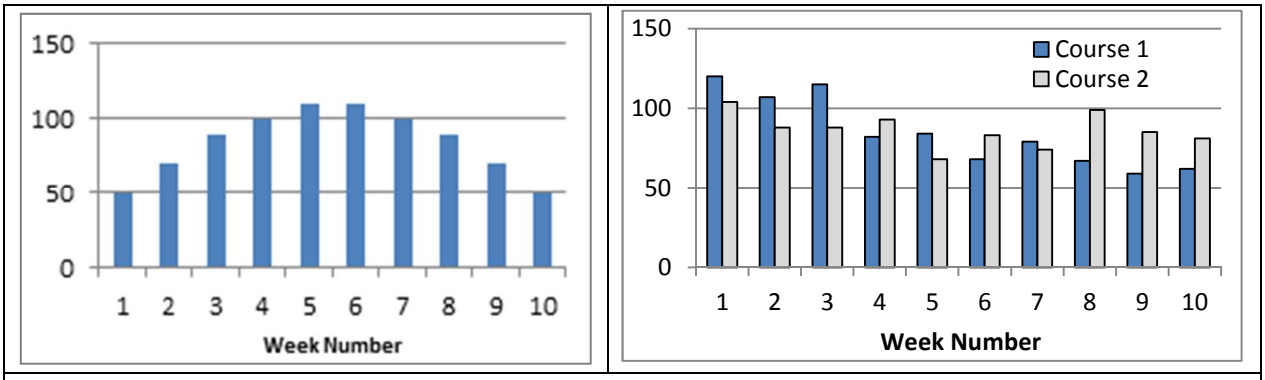

Figure 2. Discussion Participation Over Quarter Courses With General Vs. Structured Grading Schema

In courses which used a structured grading rubric to communicate how participation in discussions would be evaluated, students appeared to hit the ground running. We found that the use of a rubric which specifically rewarded interaction with peers, specified the quality of interaction related to each grade-point (posts which complicated the discussion vs. informational posts vs. agreement posts), and emphasized peer-debate and interaction, caused students to engage in active posting from day one and to interact with peer-learners more than students who took courses without this type of rubric. Sections in all courses where a structured grading schema was used started with higher participation in discussions, which declined towards the end of the quarter. The graph on the right-hand-side of Figure 2 also demonstrates the impact of instructor moderation which we found across the majority of courses. It compares two sections of the same course, taught by different instructors using the same grading rubric, discussion questions, and content. Instructors who participated only sporadically, setting the question and guiding the debate with occasional comments, saw a much higher decline in participation over the quarter than instructors who summarized the discussion at the end of the week and set a larger number of more focused questions. However, the quality of peer-debate was affected by more tightly-framed questions.

Effects of Question Structure on Stimulating Debate

Adjusting for differences across the quarter, some questions seemed to work better than others. Questions worked better when they were well-bounded but also open enough to allow students to define the

problem. When questions were too tightly-bounded, students were discouraged that other students had already provided the answer.

In a project management course, two questions posed to the same group at equivalent points in time were as follows:

Fast or Slow: *Critically evaluate the author's FAST approach. Is it useful? Practical? What are some alternatives? Is this a "real" model that could be used on "real" projects?*

Cook: *I want you to cook up a systems development project (real or imagined). Describe the goal(s), the objective(s) of the project and the scope of the work the systems analyst would need to do for the project. Post your goals, objectives and scope. I'd then like each of you to comment a bit on each other's work***.**

The *Fast or Slow* question engendered a comparatively poor response with only 46 posts, a very shallow thread depth (mostly 2 levels, question then single response), 45% of the posts were messages from Instructor to students, 37% of the messages were messages from students to instructor and only 18% of messages were student-student messages. The Cook question inspired 148 posts, several sub-threads which were notably deep (7 or 8 levels, maximum depth 11 levels) and much more student-student interaction (40%). Crucially much of the discussion was a mix of positive feedback and helpful criticism with a genuine intent to assist peers.

The *Cook* question worked better in achieving debate because the question was well-bounded, but open-ended – i.e. students were allowed to define the problem. Additionally the task was deliberately pitched as a cooperative, concrete task where students negotiated the task meaning collaboratively. Fast or Slow worked less well principally as it was five questions in one. One question was open-ended the other 4 firmly bounded, there was very little cooperative inter-student activity as the question was not pitched as a cooperative activity. Many of the messages were simple statements of opinion with little intent to encourage discussion.

Structure is also an issue when considering potential answers to a question. For example, consider two additional questions from another instructor presenting an IS course:

Prototyping: *Rapid prototyping has been a technique in many industries (e.g., aircraft design, consumer product development, etc.) for many years. Since the 1980's this technique has also been used in software development. What's the advantage to building a rapid prototype of the user interface to a system? Is it always worth the cost? What can be done to make this technique more cost-effective?*

Skills: *Does an I.T. project manager need to have technical skills? Why or why not?* Let the debate begin!

Neither of these questions generated any peer-debate or any in-depth exploration of issues. For the *Skills* question all the substantive answers were variations on "Yes" or "Yes, but they need other skills as well." A similar problem emerged with the *Prototyping* question, where few members even challenged the value of the approach or diverged from the generic response that "*users can get an idea of what the user interface will look like.*" A question with only one possible answer is not really very helpful in stimulating debate.

Effects of Question Focus on Stimulating Debate

The focus of the question, in terms of its relation to the knowledge domain, also affected the quality of debate, as demonstrated by the following two questions from an IS Management course, posed in consecutive weeks.

Does IT matter? *Read the two articles: Carr, N. , 'IT Doesn't Matter' and Champy, J. 'Technology Doesn't Matter -- but Only at Harvard.' I'd like your own insights and (informed) opinions about whether IT does matter. The article by Nicholas Carr has proven very controversial -- mainly, I suspect, because people react to it without actually reading the detailed arguments ...* ***:-)***

Managing IS Change: *How do we go about managing IS-related change? If you have any war stories, as usual, I'd like to hear them. I'd also be interested in your reflections on this topic from the Caterpillar and GM case studies.*

The social networks of activity generated by the *Does IT matter?* question vs. the *Plan to use IS* question are shown in Figure 3 – these were generated using NodeXL (Smith et al. 2010). The vertex/node size shows the degree-centrality (relative number of posts directed to this individual), while the line thickness indicates the edge weight (number of interactions between two people).

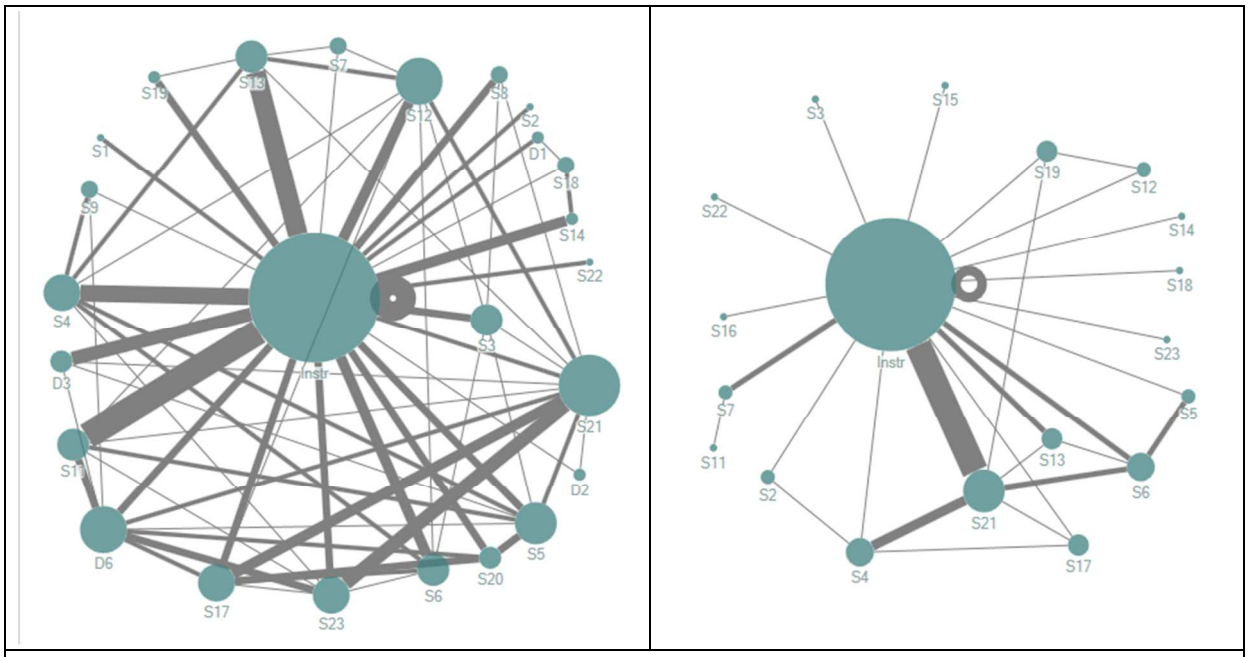

Figure 3. Discussion Participation Comparing Structured vs. General Grading Schema

As might be expected, the instructor (shown at the center of each network) is the target of the majority of posts. But the difference in the degree of debate between the first question, *Does IT matter?,* and the second, *Managing IS Change*, is quite astonishing. For the first question, *Does IT matter?,* there is a high level of student peer-peer interaction where students respond to other students' posts, not just to the instructor. Even though there are some sustained debates between pairs of students (indicated by the line thickness in the diagrams), these are interspersed with interactions with other students. This question generated 157 posts, involved all of the students in 23 sub-threads, with an average thread-depth of 4.5 and a maximum thread-depth of 10. There is a *large* core of active posters who are maintaining momentum across multiple cycles of interactive knowledge construction. Participation in this discussion is therefore fairly democratic and not dominated by one clique.

In comparison, the second question, *Managing IS Change,* generated very little debate across the same group of students. This question generated 44 posts, involved only 18 of the 21 students, even though participation was compulsory, with an average thread-depth of 2.25 and a maximum thread-depth of 6. The debate is maintained by a clique of diehard thought leaders, who interact with each other and with the instructor, but a content analysis of the postings revealed that the majority of postings appeared to be contractual (categorized as "contributor" posts, indicating minimal engagement, not elaborating on comments and not encouraging further discussion).

Why did the first question inspire so much engagement and the second inspire so very much less? Part of the answer appears to lie in the cognitive structures – the course scaffolding provided by the readings – underlying the first question. The initial reading provided a clear framework for thinking about the problem, with three dimensions that students could debate. Secondly, the way in which the question is framed followed the findings of the previous section: the question is open but bounded, there is an explicit set of issues to be considered, and a single initial focus. But an important reason for its success lay in the focus of the question. The first question is directly related to the professional course domain outcomes – students could relate the learning goals for this debate to their professional success. Many of them had direct experience of related IS applications and contexts, even though they had not considered them from

this perspective before. We concluded from our content analysis that students engaged so enthusiastically with the question because they could see its relevance to their goals in taking the course. Many students addressed the question by providing accounts of their own professional and the topic was so engaging that debate continued into the succeeding week (highly unusual).

The second question, on the other hand, appeared to be too complex to engage students. There were too many unrelated goals inherent in the question (open ended). Respondents to this question typically addressed one or two issues, with very short posts. The question was too abstract so it could not be directly related to their own experience. This contrasted with many other equally open-ended questions, where the problem-structure was explicitly related to students' own learning or professional outcomes, and so there was a much more engaged debate. For example, a question discussing outsourcing generated a huge degree of interaction, as students related the problem-structure to their professional interests.

From extensive content analysis of questions and student answers, we identified three dimensions of relevance for students: (i) related to professional career success, (i) knowledge perceived as relevant to professional domain, (iii) knowledge perceived as relevant to course domain. We can regard these as different levels of abstraction from "what do I need to know to succeed as a working professional", "what do I need to know if I want to be a professional" and "what do I need to know to pass this course". Students were most likely to be engaged with topics that had a high relevance in categories (i) or (ii). When topics fell into category (iii), active instructor mediation was required to link the topic to one of the other two categories, for students to engage in deep learning interaction behaviors.

Design of Supporting Materials for Discussion

For this example, we examined course-discussions that presented similar learning objectives but were based on different types supporting materials. For example, we identified two different IS courses in which one week was spent exploring the concept of a code of ethics for IS. In both discussions, the goal of the discussion appeared to be to familiarize students with the ethical principles governing IS development and deployment.

> *Ethics 1: You've been asked to read the ACM Code of Ethics plus two other codes of ethics of your choice. What did you learn from this process? Did any common themes or concerns tend to emerge? What did you relate to in the ACM Code of Ethics? Were there things that seemed problematic, or that you disagreed with?*
> *Supporting Materials: A list of web-pages that covered various codes of ethics + 3 articles on ethical principles in IS.*
>
> *Ethics 2: Can ethical behavior really be codified by a professional organization? Can ethical behavior be enforced? How?*
> *Supporting Materials: A short description of ethical models plus a worksheet for ethical decision making that covers: (i) actions and consequence; (ii) responsibilities and obligations.*

The first course presented students with an exhaustive set of resources that described various codes of ethics and the reasoning behind them. The second provided three pages of bullet points. But when we examined the discussions, we found that students engaged much more enthusiastically to the second course discussion (*Ethics 2*) and debated to a frequent thread-depth of four, compared to a thread-depth of two, which was achieved only twice for the first question (*Ethics 1*) – almost all student responses were directed to the instructor. In addition, many more students joined the debate around *Ethics 2* than for *Ethics 1*.

As instructors, we were surprised – we had expected the more comprehensive materials provided for the *Ethics 1* discussion to stimulate a more interactive and engaged debate. But when we examined the *Ethics 2* materials, we discovered that what we had perceived as three, rather scrappy pages of bullet-points actually offered an incrementally-presented structure for thinking about ethics from which discourse could be built. The instructor had summarized three stages in developing ethical codes, accompanied by an evaluation instrument, that allowed students to construct a theoretical and pragmatic platform by which to understand various ethical codes. The *Ethics 1* materials, on the other hand, were less focused, left students to distinguish between a whole gamut of relevant vs. irrelevant (for their purposes) issues, and provided no framework by which to evaluate the codes of ethics with which they were presented. As a result, their responses were much less rich than those of students responding to the *Ethics 2* question.

They raised fewer issues and appeared to focus on low-level details of the codes. Students responding to the *Ethics 2* question in contrast discussed broader/abstract questions of the nature of ethics, what ethical behavior means, how ethics change over time, whether it is ethical to enforce ethics and how ethics are socially constructed. This finding held more generally across the courses that we analyzed: the richness of supporting materials was of less importance in stimulating meaningful discussion of a topic than the explicit cognitive structure provided by these materials. Students appear to need a structure on which they can build knowledge before they can assimilate deep course content.

The Instructor Role in Mediating Debate

Does A Higher Frequency of Instructor Moderation Encourage Student Discussion?

Over the many courses analyzed, we found that the level of instructor interaction varied from laissez faire to constant interaction. We analyzed student posting behavior, in terms of post quantity, compared to instructor posting behavior across 12 courses. It can be seen that more interaction by the instructor (a higher number of posts) does influence student posting behavior to some extent, but this effect is not consistent.

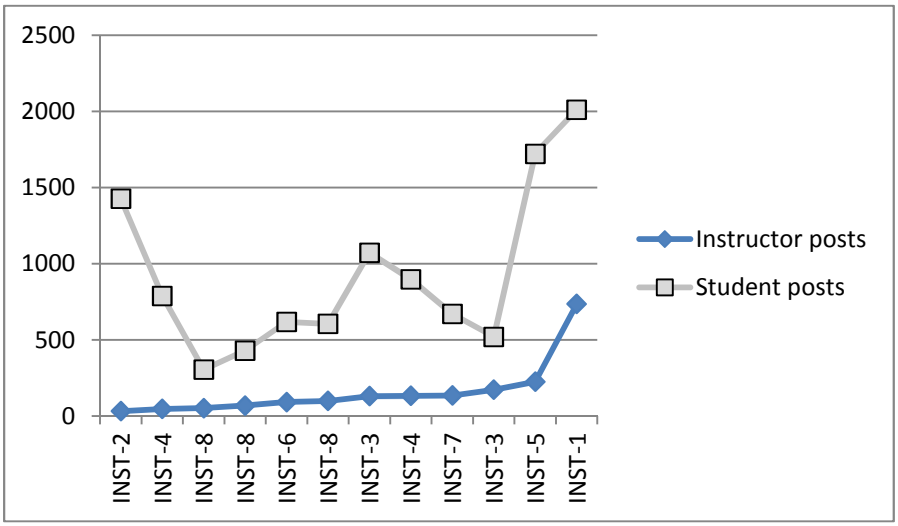

Figure 4. Posting Behavior of Students In Response To Number of Instructor Posts

We wanted to examine if differences in instructor interaction style impacted the learning outcomes from the courses. We were lucky enough to have access to course data from two instructors with polar opposite interaction styles, who were teaching online sections of the same course. They taught to the same syllabus, in the same term, with similar numbers of students (23 vs. 24) and using a majority of "identical" questions (which allowed us to control for the question design issues presented above). We analyzed the discussions around six questions from each section that were conceptually identical (i.e. had identical or substantially similar wording and used identical supporting materials).

The degree of instructor moderation appeared to have little discernible effect on the number of student responses to each question but a high level of moderation did reduce the average length of posts by 46%, compared to the low moderation course. In addition, high instructor moderation appeared to inhibit peer-peer student debate to a substantial degree. The "Low Moderation" instructor posted the question but then left students to debate it largely on their own, posting one message for every 44.56 student messages. The "High Moderation" instructor posted 1 message for every 2.73 student messages - this was the highest instructor/student post ratio of any course that we observed.

Table 2. Posts in Response To High Moderation Vs. Low Moderation By Instructor		
Question	*High Moderation*	*Low Moderation*
Systems analyst as problem solver	69	74
Agile methods	96	97
Project design	150	97
Requirements analysis	96	83
Fact finding	85	90
Data modeling practice	182	180
Average posts per question	112	103
Total posts	238	268
Total words	26270	57128
Average words/student post	110.38	213.16

Table 3 summarizes the response to a typical question, on the use of agile methods, with an almost identical number of responses. It can be seen that while the number of undirected, "broadcast" messages posted by students is roughly equivalent, the student-student messages for the high-moderation instructor average 38% of the student-student messages posted in the course with the low-moderation instructor.

Table 3. Posting Behavior Analysis For High Moderation Vs. Low Moderation Instructor		
Agile methods	*High Moderation*	*Low Moderation*
Total Messages	96	97
Instructor – student messages	16(17%)	0
Student broadcast messages (undirected)	80	97
Student-student messages	28	73
Student-instructor messages	52	24
Deep thread messages (students)	65	44
Deep sub-threads (4 levels or greater)	10	8
Deep sub-threads w/o instructor intervention	2	8

There were more deep-thread messages in the high moderation instructor's section – which demonstrates that students were motivated to engage with the discussion - and slightly more deep sub-threads. But these appeared to result directly from the instructor's facilitation behavior. To investigate what was happening, we performed a content analysis of discussions in the two sections.

Are Students More Engaged When the Professor is Entertaining?

"Professor Entertaining," whom we characterized as high moderation in the analysis above, was a highly knowledgeable industry professional with decades of experience. The professor was a very popular instructor, who interacted with students a great deal, through frequent discussion board interjections and a regular internet chat presence. This professor projected his personality into the discussion, engaging in a great number of primarily social interactions. He routinely made reference to such diverse topics as hobbies, weather, music, Disneyworld, cooking, children, Dickens, vintage cars, pets, gardening, insects, Star Wars, birds, Nintendo, Scrabble, foreign films, and beer, injecting lots of jokes and humorous references into his posts. Our summary of these posts is given in Table 4.

Table 4. Analysis of Interactions For Professor Entertaining's Course Section			
Students	23	Student Posts	1,648
Discussion Board Visits	24,095	Student Posts/Thread	24.7
Posts	2,745	Formal Questions	30
Topic Threads	67	Student Posts/Thread	67
Posts/Thread	40.9	Average Thread Depth per Question	8.6

To determine the quality of the discussion we looked at the broad nature of the message content. Threads for the Interactive instructor showed substantial evaluation and analysis and some hypothesis formation. There was a decent amount of advanced cognitive activity – indicated by students posting messages that advanced or complicated the topic of discussion - but a very limited amount of student-student interaction – meaning that students lacked opportunities for deep exploration of issues with their peers and were highly reliant on the instructor's interpretation. In their post-course survey, students evaluated the course as successful overall with a high level of student satisfaction and with high overall grades (5 B and 18 A). However there was much chaff among the wheat. About 5% of posts were unrelated anecdotes, there were 32% fluff posts: such as "LOL," "Awesome [dead rock star] story!" "OMG," "Pictures of gardening implements," and "Lawyer Jokes." Overall only 50% of the posts advanced the discourse. About 33% of messages were Student-Instructor messages.

"**Professor Serious**," whom we characterized as low moderation above, was a similarly knowledgeable industry professional, with a similar length of experience. He worked to the same syllabus, but with a much lower level of direct interaction with students and a stronger topic-focus in his discussions with students. He injected little personality into his posts, with no interaction that could be categorized as primarily social and little social interjection with students overall. Our summary of posts across his course-section is given in Table 5.

Table 5. Analysis of Interactions For Professor Serious's Course Section			
Students	24	Student Posts	1,334
Discussion Board Visits	13,079	Student Posts/Thread	3.79
Posts	1,458	Formal Questions	14
Topic Threads	352	Student Posts/Thread	95.3
Posts/Thread	4	Average Thread Depth per Question	5

With the more serious instructor there was substantially more collaborative (student-student) discourse. Overall the messages were longer and more detailed and showed a much stronger awareness of value of peer interactions. In their post-course survey, students regarded the course as moderately successful with a moderate level of satisfaction, grades were equivalent to the other section (5 B and 17 A). The messages showed a much higher task focus with far fewer (2.5%) fluff posts, about 80% of posts were intended to advance the discussion and only 15% were student-Instructor messages.

From these findings, it would appear that the ability to be entertaining influences student satisfaction with the course, but does not affect their overall achievement in terms of grade. We were able to verify from the professors involved that both instructors adopted a similar grading scheme and that their distribution of grades across multiple courses was comparable. Professor Entertaining was perceived as motivating students to engage in learning to a greater extent, but in fact the content of discussions in his course belied this perception. Students of Professor Entertaining engaged in significantly less peer-peer interaction than with Professor Serious and discussed topics that advanced their understanding only 50% of the time. Given that Professor Entertaining's students only posted 23.5% more messages, one can only conclude that they learned less from these discussions than students who took the course with Professor Serious. Our analysis of content would seem to bear this out, with a lower degree of cognitive engagement in the posts that we analyzed.

Discussion of Findings

The need for effective course structuring and scaffolding has been dealt with widely in case studies and design studies that deal with online learning environments (Salomon and Perkins 1998; Sims et al. 2002; Soloway et al. 1996). However, we were unable to find studies in the IS or collaboration (CSCW/CSCL) literatures that related course scaffolding to the design of grading schema or discussion questions and topics. The need for a structured grading rubric to evaluate learning is emphasized in the educational literature (Bransford et al. 2000). But its effect in motivating student participation in discussions has not been identified previously.

We identified three aspects of course scaffolding related to question setting for student discussions: question structure, question focus, and the design or selection of supporting materials. The issue of question structure reflects knowledge from the cognitive sciences, but this has not been highlighted in educational studies. We identified three foci that motivated students to respond more or less to questions set for discussion. Students were most likely to engage actively with questions that addressed topics related to professional career success. They also valued (although not as highly) knowledge perceived as relevant to professional domain. Topics that were most likely to be valued by instructors – relating to knowledge perceived as relevant to the course domain – were less likely to motivate students unless instructors framed them in terms relevant to one of the other two categories. When topics fell into categories valued by students, they were more likely to engage in interactive debate and to demonstrate the cognitive indicators of deep learning. This is important simply because most studies of student engagement tend to use quantitative measures such as thread depth, that indicate that students are participating, but not why. Our study has combined qualitative and quantitative measures to shed some light on a poorly-understood aspect of online learning.

We understand from the educational and psychology literatures that suitable course scaffolding aids student learning and engagement (Bransford et al. 2000; Rogoff 1990; Rogoff et al. 1996). Our studies have illuminated these findings by relating them to content structures relevant to the IS domain. Merely throwing walls of text at students is far less engaging than providing materials that are concise and provide a structure for thinking. We need to combine the scaffolding of supporting materials with framing questions to allow the supporting material to be brought into play because the relationship between question structure and materials structure is made explicit.

Finally we explored the instructor role in mediating debate in online courses based on asynchronous discussion. We deconstructed the myth of the Entertaining Professor, to conclude that successful course moderation hinges on the quality, not the quantity of instructor interventions. Instructors need to be able to carefully judge when to intervene and when to let students continue. This does not mean instructors can be completely absent from student discussions - even Professor Serious maintained a suitable online presence via his “Ask Dr X” forum. But being entertaining is not essential for success. In fact, it may be counterproductive, as it appears to diminish student-student debate significantly. Excessive student interaction in discussions incurs a great deal of work, often with no real benefits. Most importantly, highly interactive instructors runs the risk of shifting the focus from the course domain to the instructor.

Our findings have also underlined the difficulties inherent in considering students enrolled in an online course for a single quarter or semester as a community of practice. It is clear from the patterns of interaction described above that in some weeks, on some courses, the majority of students were highly engaged and motivated by a topic of discussion and that they developed a consensus perspective on how to apply domain-related knowledge, based on peer interactions and deep learning from the discussion. In other weeks and other courses, students behaved as a collection of individuals, drifting in and out of the discussion with no clear motivation other than the contractual participation that they needed to earn their grade. It is for this reason that we prefer to conceptualize online learning groups as a network of practice (Brown and Duguid 2001). We argue that a network of inquiry presents a special case of a network of practice, as a stable group of individuals with strong social ties engage in shared learning across time and across distance.

Limitations of the Study

There are a number of limitations of this study, not least that we conducted our analysis within a single college of a single university. Comparisons between groups of students have the inevitable weakness that some groups are just more motivated or more able than others. The same group of students that spent so much time on fluff postings may have done the same even under the tutelage of Professor Serious. Some less successful questions were posed at the same time as questions which engendered a lot of discussion. Could it be that students simply felt they had done enough for the week? Under a different set of circumstances, would a highly socially-oriented group be incapable of sustaining a discussion without extensive instructor intervention? The students under study were graduate students; these may arguably be more committed as most were more mature and were also practicing industry professionals or putative professionals. Whether undergraduate students would show the same types of commitment is an open question. Finally, all the groups under study involved domains that were relatively technical; even within these two domains there were some differences. Students in the domains under study could be expected to be highly familiar with technological environments and thus comfortable in the use of the discussion boards. Would students from professional domains related to the Arts or Humanities be as comfortable with technology, behaving in the same manner? We will leave that to other researchers to investigate.

Conclusions

What can we take away from these results? Perhaps not surprisingly question design can be crucial to engagement in online discussion. Questions that are too broad, too open, too abstract, too complex or combinations of the above have an inhibiting effect on discussion. Discussion needs to be framed as a collaborative not competitive experience (numerous students opined that this was feature they enjoyed most about online discussions). Having questions that are directly relevant to student experience helps. If students can use war stories, company policies and experiential knowledge to elaborate online learning debates, they can complicate the thinking of others to inspire deep learning across the group network.

For many cognitive tasks, students need to extend their current abilities. Students however cannot simply slide from not knowing to knowing. In order to be able to achieve a task they need a solid foundation and incremental knowledge structures that provide effective scaffolding of the learning process. Principally, students need sufficient supporting materials, a strong identification with the domain and suitable peer support. In terms of supporting materials we found a large variability in the volume, suitability and focus of the materials provided to support online learners, even across two courses running online in the same term. It is important for instructors to be educated in what constitutes effective scaffolding – both in terms of process and the cognitive structures embodied by course materials.

In future studies, we plan to experiment with the design of course questions, grading rubrics, and instructor intervention schemes, across multiple simultaneous sections with more or less complex question designs. We also plan to explore student perceptions and motivations in more detail, to understand the elements that aid them in asynchronous, online learning.

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