

# Instructor Influence on Reasoned Argument in Discussion Boards

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*In this study, we explore the extent to which two instructional techniques promote critical discourse in an online class on educational standards and curriculum: instructor stance (challenging/nonchallenging) and topic level (higher order/lower order). Posts from 25 students, across four modules, were analyzed. These four modules constituted approximately one third of the course, and were selected because the professor was the sole facilitator for them. Results indicate that, regardless of topic level, a challenging stance by the professor had a positive effect on the percentage of student posts that referenced readings and theory. There was an interaction between level and stance on student use of reasoned argument. Lower order challenging forums were associated with a greater percentage of reasoned posts. This may be due to the abstractness of the professor's probes in higher order forums. Implications for future research include empirical investigations incorporating contextual variables and qualitative studies to ascertain how students engage with bulletin boards.*

□ One of the goals of higher education is to foster in students the ability to engage in critical discourse in their area of expertise (e.g., Browne & Freeman, 2000; Pithers & Soden, 2000). Critical discourse involves referencing facts, the positions of experts in the field, and the perspectives of others in the discussion. Critical discourse also involves the ability to reason within the discussion—to put forth a thoughtful or reflective statement or argument.

In ill-structured, abstract knowledge domains such as the social sciences, evidence suggests that students need support to develop the ability to engage in critical discourse (Scheurman, 1996; Scheurman & Newmann, 1998; Voss & Means, 1991). There are several techniques that can be employed to foster critical discourse abilities among students. One of the most important is discussion, which is used as a means to help students develop a critically informed understanding about topics (Brookfield & Preskill, 1999).

The instructor has a fundamental role in facilitating productive discussion (e.g., Auster & MacRone, 1994; Ellner & Barnes, 1983; Nunn, 1996). In face-to-face environments, there has been substantial research on specific techniques employed, including cognitive level of discussion topics and instructor stance (e.g., Clasen & Bonk, 1990; Gallimore & Tharp, 1998; Ge & Land, 2003; Redfield & Rousseau, 1981). *Cognitive level* refers to the type of cognitive functioning required to address the topic, and is frequently categorized in terms of Bloom's *Taxonomy of Educational Objectives* (1956). *Stance* refers to the position the instructor takes in dis-

cussion. At one extreme, the instructor can take a background role, letting students initiate ideas. Here, the instructor is supportive and informative, but not challenging. At the other extreme, the instructor can take a more active role, challenging students to articulate and defend their positions in different contexts. (Illustrative examples of posts classified in each stance are given in the Methods section.)

Despite the fact that the instructor's role is just as important in distance learning as in face-to-face environments, there is far less empirical research in this field. As Clark (1994) pointed out, there is an important distinction between an instructional method and a technological delivery system. "It is method which is the 'active ingredient' or active independent variable" (p. 26). This study is an effort to address the need for research on instructional method in distance environments by examining the effect of cognitive level of the topic and instructor stance on student use of critical discourse in asynchronous bulletin board discussion. The next sections outline the research and theory related to topic level and stance in discussion in both face-to-face and distance environments.

#### DISCUSSION IN FACE-TO-FACE ENVIRONMENTS

Research suggests that the cognitive level of the topic on which students must focus has a great impact on their thinking. More complex topics are related to more thoughtful discussion among students (Clasen & Bonk, 1990; Ellner & Barnes, 1983). A meta-analysis by Redfield and Rousseau (1981) validated the educational benefits of teachers asking "higher order" topics. For instance, topics eliciting evaluation, analysis, and reflection can facilitate student ability to represent problems, and generate and justify solutions, as well as their ability to monitor and evaluate their problem-solving processes (Ge & Land, 2003).

From a sociocultural perspective, cognitive strategies such as critical argumentation are most readily appropriated from situations in which these strategies are used in collaboration and joint activity. Vygotsky's (1986) concept of a

zone of proximal development presents a path for the student from other assistance to self-assistance. For the teacher, this concept presents teaching as an opportunity for assisted performance. Gallimore and Tharp (1998) outlined seven teaching strategies that a teacher can use to assist the student, one of which is in the foreground in this article—assistance questioning. According to the authors, assistance questions are inquiries made in order "to produce a mental operation that the [student] cannot or would not produce alone" (p. 182). In higher education, this method has been shown to be effective for student learning (Nunn, 1996). Thus, in face-to-face instruction in higher education, professors may find success with fostering critical discourse abilities in students by posing higher order discussion topics, and challenging students to become actively involved in discussion.

#### DISCUSSION IN ASYNCHRONOUS ENVIRONMENTS

There is substantially less research-based guidance for facilitating critical discussion in asynchronous environments. Some educators purport that the asynchronous nature of bulletin board communication may facilitate reflection, and thereby lead to focused discussion that is rich in content, complex in ideas, and involves egalitarian participation among students (Bonk & King, 1998; DeBard & Guidera, 2000; Schwir & Balbar, 2002).

Evidence suggests, however, that this characteristic is not in and of itself sufficient to foster critical discourse. For instance, Kanuka and Anderson (1998) found that bulletin board participants rarely engaged in critical discourse. Fewer than 10% of more than 200 posts were classified in this manner. In fact, rather than address areas of contradiction, participants seemed to avoid them. Other research has found that bulletin board postings tend to be fractured, isolated, haphazard in topic development, and lacking in exhibition of higher level thought (e.g., Gunawardena, Lowe, & Anderson, 1997; Hewitt, 2003; Thomas, 2002).

In each of these investigations, instructor participation was either limited or nonexistent.

These researchers hypothesize that the lack of focus and coherence is because of the nature of the medium, and contemplate that if the differences are so fundamental, it is not possible to define discussion in the same way in both environments. They call for further investigation of whether and how the instructor can foster critical discourse in distance learning environments.

Two methods successfully used in face-to-face discussion—topic level and stance—may be of particular import in distance learning. Because of the separation of time and space in asynchronous environments—with students and the professor reading and responding at their own pace—each individual post has the potential to receive more attention than it would in a face-to-face environment. From the instructor's perspective, this suggests that the manner in which he or she crafts the learning task (in this case, the discussion topic) and responds to students may be critical to the course of the discussion.

The research that does exist on the instructor's role in distance learning discussion is related to stance. Findings, however, are inconsistent. Some studies suggest that the professor should be challenging in order to foster critical discourse (e.g., Jiang & Meskill, 2000), whereas other studies have found that students engage more in discussion and grounded disagreement when the instructor takes on a non-challenging role (e.g., Ahern, Peck, & Laycock, 1992; Marttunen, 1998).

In the face of strong popular and political support for distance learning in higher education (Allen & Seaman, 2003; McCoy & Sorenson, 2003; Watts, 2003), the lack of empirical data to guide instructors faced with teaching in this environment must be addressed. In this study, we examine the effect of topic level and instructor stance on student tendencies to display evidence of critical discourse in postings. We hypothesized that (a) higher order topics would promote critical discourse in student posts, and (b) a challenging stance by the instructor would promote critical discourse in student posts.

## METHOD

### Student Participants

The context for this study was a course on educational standards and curriculum that was part of a distance-learning program offered by the school of education at a large Northeastern university. The program is an EdM in general education marketed to students with provisional teaching certification. The course was taught completely online, by the third author of this article. Twenty-seven students were enrolled in the distance-learning program; 5 students not in the program (i.e., on-campus students enrolled in other degree programs) also registered for the course, for a total of 32 students. Our analysis included 25 students, representing all individuals who posted at least 13 times during the data collection period. The remaining 7 students each posted fewer than 5 times over that time period, and as such, were deemed not engaged in the course. Their posts were not analyzed. (None of these individuals successfully completed the course: 4 officially withdrew, 2 received F grades, and 1 took an incomplete.)

There were 19 female and 6 male students in the sample used for analysis. The average age was 33.2 years, with a standard deviation of 7.37 years. The youngest student was 23 and the oldest 49 years old.

### The Course and Forum Conditions

The primary activities of the course were readings, assignments (60% of final grade), and discussion (40%). Assignments included comparing national and state standards for a particular subject area and age group, critiquing a lesson, and designing a lesson. Discussion involved participating in the Web bulletin board forums for each module. The focus of this research is on the bulletin boards.

For each module, the professor initiated four discussion topics based on the readings. Each topic was introduced in its own forum, and the professor counseled the students to try to stay on topic within each forum. Students were encouraged to spend at least one hour per week

on the discussion board and to post at least five times per week. The professor selected these as guidelines based on what was considered a reasonable amount of time to invest in the context of other course assignments. Additional guidelines for postings included “Concentrate on thoughtful responses, rather than simple responses. Avoid summarizing or restating material from group readings or other posts (but pulling in material from other sources that the class has not seen is fine, of course).”

There were 11 modules in the course. The first 3 and the last 2 addressed curriculum and standards in general; the 4th module addressed mathematics standards, whereas the 5th through the 9th focused on other content areas. The professor facilitated the online discussion in the general modules and in the forum devoted to mathematics standards, his area of expertise. Faculty with expertise in the remaining content areas cofacilitated these discussions. This research examines the first 4 modules—those before any cofacilitators joined. Modules 1 and 4 were two weeks in duration, and Modules 2 and 3 were approximately one week. The difference in duration was a function of the way class topics were organized and the import the professor placed on them.

In each module, there were four forums, each representing a distinct topic. Each of the forums was classified on the two dimensions of interest—(a) topic level and (b) stance the instructor would take with his postings. Thus, each module contained a (a) higher order, challenging, (b) lower order, challenging, (c) higher order, non-challenging, and (d) lower order, non-challenging forum. All students were, therefore, exposed to all conditions. The professor wished to address several discussion topics throughout the week; the specific number of topics—four—was determined by the research design.

Higher order topics required responses from the analysis, synthesis, or evaluation levels of Bloom’s *Taxonomy* (1956). An example of a higher order topic is, “Who should be responsible for creating standards? Analyze the issues related to the question, using authoritative opinions, evidence, and reasoning.” Lower order topics were those that required responses from the knowledge, comprehension, or application

levels, such as, “On the basis of your readings, define what an educational standard is.”

The second dimension, instructor stance, was either nonchallenging or challenging. When adopting the nonchallenging stance, the instructor took on the role of being supportive and acknowledging responses, providing information, and asking for clarification. For instance, the following are excerpts from four non-challenging posts by the professor:

1. I couldn’t agree more on our society’s impatience. In a media-driven culture, it could be that we hardly ever wait for research to “catch up.”
2. Good questions about the 12+ range; I’ll be interested what others have to say.
3. Politicians favor the “mastery” type, yes. Teachers usually don’t.
4. Yes, but I think you’d agree that there are several “variables” here. One is that some are “good” at tests like you say, other excel in other forms. Another that others were emphasizing [t]he nature of what usually gets tested . . . too often minimal knowledge items.

In Post 1, the professor is encouraging. He validates the student’s opinion and expands on it with his own example. Similarly, Post 2 has an encouraging tone. Here, rather than adding information, the professor simply invites others to join the discussion. Post 3 is an example in which the professor provides a factual response to a student’s question. In Post 4, the professor is both encouraging and informative.

The instructor’s posts in the challenging stance were supportive and informative as well. But this condition also called for asking students to defend their positions, requesting empirical data or theoretical foundation (if not provided initially), pointing out disagreements between students, and providing conflicting evidence or opinion—playing devil’s advocate. The following is an excerpt from a challenging post by the professor:

Interesting idea, and one that keeps “floating up to the surface” in many of our conversations. I THINK you are re-defining what “objective-based” means by re-defining the role and nature of objectives, is that right? (That’s fine, but we have to be clear to communicate with one another.) . . . In any case, let me ask you some “Devil’s Advocate” questions: 1. Don’t you think standards as such are meaningless . . .? 2. You say “CONCERNED” as if others you don’t mention ([. . .])

representatives, national organizations, subject-matter experts) are not concerned. Is that implied? . . .

In this post, while being supportive and acknowledging of the student, the professor also pushes the student to consider alternative viewpoints and to further describe and support his or her view. Contrary to the nonchallenging Post 2, for instance, the professor does not stop with a general invitation to others; his questions are specific and directed.

Validity of Conditions and Equity of Responses

As a preliminary analysis, the validity of the two conditions and the equity of the professor's responses to students were examined.

*Validity.* The validity of the cognitive level of the topic was addressed during the course. For each module, the professor developed two higher order and two lower order topics, and related explanatory details. His two teaching assistants reviewed the topics and explanations and their classifications. There were two instances in which one of the teaching assistants perceived that the professor's topic or explanation was ambiguous in such a way that students could misinterpret it. In these instances, the explanation and question were refined until all three individuals agreed that the ambiguity was eliminated and the topic was at the intended level.

To explore the validity of the professor's posting stance, each of his posts was examined. Each time the professor logged on, he attempted to respond to all of the posts that were new since his last time on the board; he did not make a distinction between forum type in choosing whether or not to reply. Over the course of these four modules, he posted 282 times (132 in challenging and 150 in nonchallenging forums). Three of the posts in the nonchallenging forums were for clarification and not in response to a student's post; these posts were eliminated from analysis. Each of the remaining posts was coded for characteristics consistent with the professor's definitions of the two stances. Features that were

considered challenging included pointing out contradictions and asking for reactions to them, asking for support from the readings or other research, and asking for further justification or explanation, such as additional evidence or concrete examples. Nonchallenging features included acknowledging or supporting posts, and giving information. Table 1 displays the proportion of posts with each characteristic.

Table 1 □ Percentage of professor's posts with challenging and nonchallenging features.

Forum Type Feature	Challenging	Nonchallenging
<i>Challenging</i>		
Contradiction	62.9	0.7
References	22.0	0.0
Evidence-explanation	19.7	0.0
<i>Nonchallenging</i>		
Acknowledging-supportive	79.5	85.0
Gives information	33.3	46.9

*Note.* Multiple coding permitted.

The table provides evidence that the integrity of the conditions was maintained. The professor engaged in challenging behavior almost exclusively in the challenging forums. For example, he pointed out areas of contradiction in 63% of his posts in challenging forums and less than 1% of posts in nonchallenging forums. The nonchallenging features were present in both types of forums, which is also consistent with the professor's role. That is, the research design of this study called for the professor to be supportive in *both* types of forums.

*Equity.* The professor's response patterns were also explored for a tendency to respond to specific individuals. For this analysis, it was not appropriate to examine for each student patterns in the proportion of posts to which the professor responded, because of differences in opportunity to respond. For instance, some stu-

dents typically posted in the final hours that the forums were open. It was unlikely that anyone (either the professor or any other students) responded to such posts.

Therefore, we used other students' responses as a baseline and examined differences between the proportion of each student's posts that received a response from (a) the instructor and (b) other class participants. The mean difference was 0.02 ( $SD = 0.187$ ), which was not significant ( $t = 0.43, p < .673$ ). The professor's posting patterns were comparable with the rest of the class as a whole; he did not exhibit a tendency to respond to certain individuals more than expected.

### Outcome Measures

This study investigated the effect of forum condition on student use of critical discourse in bulletin board posts. Two indicators of critical discourse were employed—referencing and reasoning; each student post was coded for the *absence* (0) or *presence* (1) of each of these indicators. Referenced posts were those that referred to readings, research, or the like. Posts that were not referenced tended to contain only statements of opinion or personal experience. Reasoned posts were those that put forth a thoughtful or reflective statement or argument. There were, for instance, posts in which the writer engaged in rhetorical argument, such as comparison. Other reasoned posts were those in which the student described a problem and proposed a solution, described the pros and cons of an issue, "thought aloud" in an effort to develop an understanding of an issue, and/or posed and worked through if-then propositions.

For example, the following student post is both referenced and reasoned. Note that the student begins the post by referring to a reading for the week that described an approach to developing teaching standards utilized in Japan. The student then thinks aloud, trying to apply the approach to the United States, and make accommodations based on differences in cultures, educational systems, and the like.

I believe that the main question here is time. From the reading it would seem that the Japanese have the right idea in their approach to development of curriculum,

but the process takes 6 months or more. We have become a society where time is fleeting and we have so many responsibilities and activities that 6 months seems like a lifetime. Perhaps we need a new department in the profession that is solely dedicated to curriculum development, which I know is in place at the higher levels of academia, but there needs to be better communication between these developers and the levels below them that they are developing for. Many teachers just do not have time to read the many research based articles that come out of this development. Perhaps a partnership between college, high school and elementary level professionals would be the best way to approach curriculum development and implementation on a large scale, not just in select areas or districts.

Not all posts that were reasoned were referenced, or vice versa. In the following post, for example, the student referenced the reading, but in a descriptive manner only, not elaborating in a way that constituted reasoning:

Who are standards for? According to the memorandum from the State Dept. of Ed. regarding "Standards to Assessments" standards provide a wealth of information for students, teachers, school administrators, parents, school board members, business/community, and higher education administrators.

In many instances, a student's post was neither reasoned nor referenced. Posts of this type tended to involve statements of opinion or personal tales, such as in the following:

I too feel that standards are helpful in preparing lessons but that we are given the standards and not given any more information. I am in my first year teaching full-time in my own classroom. Last year I did 2 maternity leaves and was given copies of the standards for NY. However, that was it. No one told me how to implement the standards in my lessons the best way.

The outcome measures were expressed as percentages. Thus, in addition to coding each post on the reference and reasoning dimensions, data were also collected on the total number of posts each student made in each of the four forum types. Outcome measures were derived by determining for each student the percentage of posts in each forum type that were (a) referenced, and (b) reasoned. As such, the outcome measures were controlled for potential differences in quantity of posts by condition.

*Reliability.* The first two authors of this article coded the posts. To establish inter-rater reliability, we each independently coded all 36 student posts in the first forum. We then compared codes. Initially, there was no disagreement in whether a post was referenced, but we did differ in coding of reasoned for 4 of the 36 student posts (11.1%). Through discussion, we reconciled differences in interpretation, and generated a list of types or categories of reasoning and referencing that a student post may contain, as described in the Outcome Measures section (e.g., rhetorical argument, problem-solution, etc.). This procedure—coding independently and comparing results—was continued for two additional forums. In neither of the two additional forums was there disagreement about referencing. In the second forum, we initially had differences for 2 of the 30 student posts with regard to reasoning. In the third forum, comparisons of initial coding indicated 100% agreement on the 53 student posts. Thus, we divided the remainder of the 16 forums between us and coded independently, seeking input on posts for which one of us was unsure, and also randomly checking one another's coding.

## ANALYSES

Of principal interest in this study was the effect of forum conditions (topic level and instructor stance) on the extent of referencing and reasoning in student posts. Although the relationship of these conditions to quantity of posting was not part of the research design, it was considered an interesting supplemental question.

Two separate repeated-measures analyses were conducted. The first analysis used an analysis of variance (ANOVA) model with topic level (higher order or lower order) and instructor stance (challenging or nonchallenging) as the two independent factors, and quantity of posts as the dependent variable. This was a totally within-subjects design; all students were exposed to all four forum types (higher order challenging, higher order nonchallenging, lower order challenging, and lower order nonchallenging). The model tested the topic-level main effect, the stance main effect, and the inter-

action of topic level and stance. The second analysis used a multivariate analysis of variance (MANOVA) model, also with topic level and instructor stance as the two independent within-subjects factors. The two dependent measures in the MANOVA were (a) reasoning and (b) referencing in student posts. For both analyses, an alpha level of .05 was used; follow-up tests were employed as necessary.

## RESULTS

### Primary Analyses

Results of the first analysis, with forum level and instructor stance as the independent factors and quantity of posts as the dependent variable, revealed a significant interaction between stance and level ( $F(1, 24) = 5.837, p < .024$ ). Follow-up tests describe the nature of the interaction. In lower order forums, a nonchallenging stance resulted in a greater quantity of student posts ( $F(1, 24) = 8.013, p < .009; \eta^2 = .250$ ). The mean numbers of posts in the conditions were 7.40 (nonchallenging) and 5.52 (challenging). (Descriptive statistics for outcome variables are contained in Table 2.) In higher order forums, conversely, instructor stance did not have an effect on quantity of student posts ( $F(1, 24) = 0.893, p < .354; \eta^2 = .036$ ). The average number of posts was 6.06 in challenging forums, and 6.00 in nonchallenging forums.

Neither the main effect for topic level ( $F(1, 24) = 0.152, p < .700, \eta^2 = .006$ ) nor the main effect for instructor stance ( $F(1, 24) = 2.580, p < .121, \eta^2 = .097$ ) was significant. Thus, when considered alone, neither level nor stance is significantly related to the quantity of student posts.

The results of the second analysis, the MANOVA with level and stance as the independent factors and referencing and reasoning as the dependent variables, yielded a multivariate interaction between level and stance ( $F(2, 23) = 6.985, p < .004$ ). Univariate tests indicated that the interaction was significant for the reasoning dependent measure ( $F(1, 24) = 11.071, p < .003$ ), but not for the referencing measure ( $F(1, 24) = 1.102, p < .304$ ). Follow-up tests on the reasoning measure describe the nature of the interaction.

Table 2 □ Means and standard deviations for the quantity, percentage of referenced, and percentage of reasoned posts by instructor stance and forum level.

Forum Level		Quantity		Referenced		Reasoned	
		Challenging	Non-challenging	Challenging	Non-challenging	Challenging	Non-challenging
High	M	6.06	6.00	0.342	0.200	0.155	0.160
	SD	2.483	3.055	0.1931	0.1947	0.1519	0.1706
Low	M	5.52	7.40	0.264	0.199	0.340	0.153
	SD	2.874	2.658	0.2054	0.1551	0.2715	0.1492

Note. M = Mean; SD = Standard deviation.

In lower order forums, students were more likely to post reasoned messages when the instructor adopted a challenging compared to a nonchallenging stance ( $F(1, 24) = 9.835, p < .001; \eta^2 = .291$ ). The averages in the sample were 34.0% for challenging and 15.3% for nonchallenging; students were thus 2.2 times as likely to produce reasoned posts when the professor was challenging. In higher order forums, conversely, instructor stance did not have an effect on reasoning ( $F(1, 24) = 0.021, p < .887; \eta^2 = .001$ ). The average reasoned posts for the challenging stance was 15.5%, compared to 16.0% for the nonchallenging.

The multivariate main effect for instructor stance, controlling for topic level, was also significant ( $F(2, 23) = 7.380, p < .003$ ). Univariate tests revealed a significant relationship for both dependent measures; challenging forums were related to a greater percentage of referenced posts ( $F(1, 24) = 8.590, p < .007; \eta^2 = .264$ ) and of reasoned posts ( $F(1, 24) = 7.205, p < .013; \eta^2 = .213$ ). On average, 32% of student posts in challenging forums were referenced, compared to 20% in nonchallenging forums. For reasoning, averages were 24% for challenging forums and 16% for nonchallenging. In light of the significant interaction between stance and topic level as just described, the main effect of stance on reasoning must be interpreted with caution, however.

The main effect of topic level was also significant, based on multivariate tests ( $F(2, 23) = 4.033, p < .032$ ). Univariate tests indicate that the main effect was not significant for referencing ( $F(1, 24) = 1.226, p < .279; \eta^2 = .049$ ), but was signif-

icant for reasoning ( $F(1, 24) = 4.599, p < .042; \eta^2 = .161$ ). Lower order forums ( $M = 23%$ ) were associated with a higher percentage of reasoned posts than were higher order forums ( $M = 16%$ ).

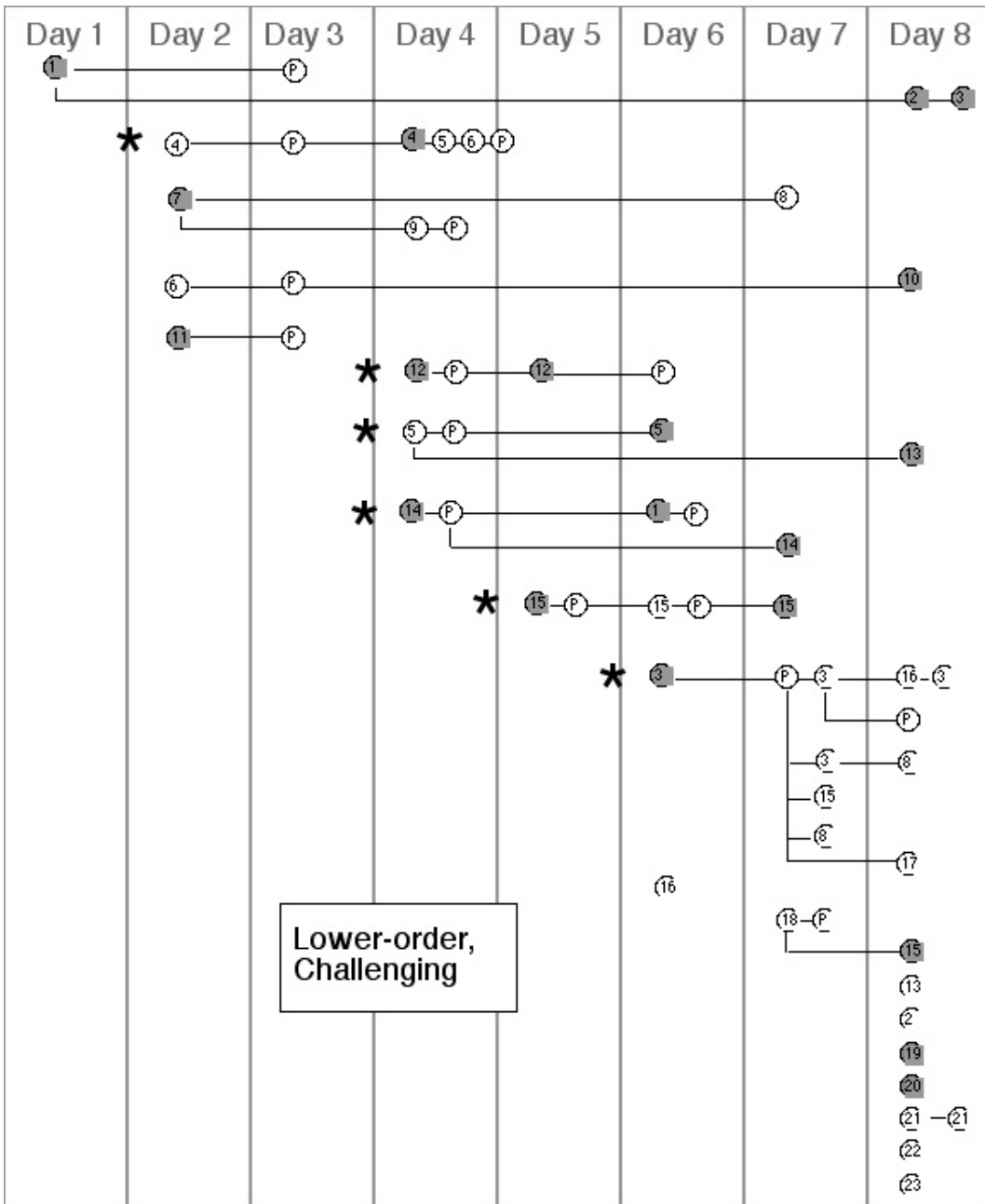
In summary, a lower order topic level is associated with a greater percentage of reasoned posting among students, but does not have a significant effect on referenced posting. A challenging stance on the part of the professor is associated with a greater percentage of referencing in student posts. A challenging stance is also associated with a greater percentage of reasoned postings, but only in lower order forums.

### Secondary Analyses

In an effort to understand the nature of the significant relationship, particularly the interaction involving reasoning, we explored two aspects of the forums—thread structure and post content. Thread structure was examined first, using primarily descriptive statistics. Of interest were (a) individual students' posting activity, and (b) where the reasoned posts occurred within threads. We developed a diagrammatic representation of each forum depicting these features. Figure 1 shows one of the lower order challenging forums. Each post is represented by a circle; students are identified by numbers, and the professor is denoted with a P. The shaded circles represent reasoned posts. Posts are displayed chronologically by both axes. The horizontal axis demarcates the day of the module that a post occurred. The vertical axis displays thread chronology; the earliest threads are at the top of



Figure 1 □ Posting schematic of a lower order, challenging forum.



the axis, the latest at the bottom. For example, in the forum depicted in the figure, Student 4 is second to post, starting the second thread. The post is not reasoned. The student receives a reply from the professor on the third day of the forum. On the fourth day, Student 4 responds to

the professor with a reasoned post. On that day, Student 5 responds to Student 4, and Student 6 to Student 5. On Day 5, the professor responds to Student 6.

In the forum depicted in Figure 1, there were some students who posted only on the last day

that the forum was open, as is evident by the latest (bottommost) seven threads. This behavior was evident across all forum types, and was typical of the same students in all forum types. We referred to these students as *stragglers*.

The stragglers constituted a minority of the class; most students made their initial posts during the first few days of a module. In addition, several students returned to a thread at least once and replied to someone who had commented on a post. The threads with an asterisk in Figure 1 represent this posting pattern. We referred to these students as *minders* because they returned to threads they started or entered. This may be similar to turn taking in a face-to-face conversation. For instance, in the second thread displayed in Figure 1, Student 4 initiates the thread on Day 2. The professor responds the following day, and Student 4 returns to the thread on the third day and responds to the professor. Thus, we considered such students to be minding their threaded discussion.

It is interesting to note that although students did respond to one another, the majority of the minding came in response to the professor. These patterns were apparent for all four of the forum types; in total, approximately 84% of the minding was in relation to the professor. In sum, there is consistency across forum types in the features of the threads described thus far (e.g., minding, straggling, chronology). The schematics of the remaining three forum types are similar to that depicted in Figure 1.

The second aspect of thread structure focused only on reasoned posts, and explored where in threads the reasoning occurred (at the start, in response to the professor, or in response to another student). In Figure 1, the shaded circles represent the reasoned posts. From Figure 1, it is apparent that—in lower order, challenging forums—reasoned posts tended to come either at the start of a thread or in response to the professor.

In terms of starting, the existence of reasoned posts to initiate a thread lends credence to the supposition that one of the benefits of asynchronous discussion boards is that participants have time to compose and edit before “speaking.” This pattern of reasoning to start a thread was consistent across all types of forums; in total,

approximately 43% of all reasoned posts were at the start of a thread.

This was not the case for reasoned posts being located in response to the professor, however; this pattern was not consistent across all forum types. In fact, it was only the case in lower order, challenging forums such as those depicted in Figure 1. In neither of the nonchallenging forum types (higher or lower order) did students tend to construct reasoned posts in response to the professor. In higher order nonchallenging forums, of those reasoned posts not at the start of the forum, only 14% were in response to the professor; by comparison, in lower order nonchallenging forums, there were 27%. This finding is consistent with research on face-to-face discussion (e.g., Gallimore & Tharp, 1998; Nunn, 1996), and with our hypothesis that a nonchallenging stance would do little to promote reasoned discourse. In addition, the fact that the percentages are below 50% suggests that when the instructor was only supportive or informative in his posts, these students found their colleagues’ posts more provocative than the professor’s, in terms of promoting reasoned responses.

The significant interaction between level and stance indicates that our hypothesis asserting that a challenging stance by the professor would promote reasoning was not uniformly supported. This is demonstrated in the discrepancy between the proportions of reasoned posts that are in response to the professor in challenging forums. In higher order challenging forums, 35% of the students’ reasoned posts that were not at the start of a thread were in response to the professor. In lower order challenging forums, however, the figure was almost twice this, 69%. This discrepancy may be the heart of the interaction between instructor stance and topic level on reasoning.

This pattern led us to look at the data from another perspective. We focused on just the forums when the professor was challenging, and explored the content of posts. Table 3 displays portions of six threads from challenging forums. The threads are denoted by numerical labels (Th1, Th2, Th3, etc.). For each thread, the first post is the instructor’s response to a student’s post (which is not transcribed), and the second is

Table 3 □ Content of portions of threads in challenging forums.

<i>Thread</i>	<i>Professor</i>	<i>Student</i>
<i>Lower order topic level; Student posts are reasoned</i>		
Th1	What kind of political influence do you think may be present at the state level that's not at the national level (recalling, of course, that one is a government agency, the other a professional organization)?	I think it all boils down to money (that's the devil speaking again). I don't know much about the state's funding for education, but I know it doesn't come from the lottery. Government is run by money, and money is controlled by big business. Smells political, huh? I imagine that the state reacted to a pressure for better education without realizing, or perhaps acknowledging, how much time, effort, and money would go into creating a complete and sound set of standards. I imagine it was something like this: "Look at this problem!" (On your marks . . .) "Standards will correct it." (Get set . . .) "Make 'em!" (Go!) Perhaps the funding was cut off before the runners got to the finish line. I really don't know, but it sure seems that way. I think the NCTM probably had more time for reflection and correction, and a supply of money that was not dependant on government whims.
Th2	Do you think, though, that Standards-based curriculum still just go ahead and (have to) establish short-term objectives anyway?	Do I think standards based curriculum goes ahead and makes short term goals anyway . . . that's something I admittedly didn't think about. So now that I think of it, yes, I think standards based has short term goals but I think that teachers are the ones creating them in order to adjust to their student's developmental needs. An objectives based curriculum seems to have already laid out the short term goals, making it more difficult for teachers to modify their instruction. One more advantage of standards based in my opinion
Th3	Is the standards-based CURRICULUM more rigid? I might have said the opposite! The goals might be more universally defined and accepted, but I'm not sure about the curriculum. Please tell me what you think.	Well, where to begin? NYS standards state what students should be able to do at certain grade levels. If a school creates its curriculum under the assumption that the students can do certain things at a certain age (or around that age), then it makes sense for them to create a very linear curriculum. This seems rigid to me. To twist the topic a bit, I must also comment that curriculum alignment amazes me. I can understand wanting to avoid gaps, but overlaps? I have students who forget their locker combinations over spring break. They could use the review!
<i>Higher order topic level; Student posts are not reasoned</i>		
Th4	I know they are trying to integrate science and mathematics, but it does sometimes seem like they lose on one hand what they gain on the other. Don't you think that someone might say that we have to start over (or at least revise) to keep up with changes in society and changes in knowledge?	I absolutely agree that we need to continue to change and grow as an educational institution. However, I also believe we need a basic foundation of educational standards that do update as needed, but also allow teachers and students to remain sure footed throughout the changes.
Th5	Good point. But what is "function successfully"? To be aware of the depth of human creativity through great works of art and literature . . . or able to fill out an application? One could argue either way. Who decides that? The "social utility" movement of the first half of this century had people canvas professions to see what math they needed to know. They figured you needed fractions, but only halves, fourths, eighths, and a few others No sevenths. People didn't use them. Is this the way to understand math?	When I say "function successfully" I mean that a person could achieve what's important to them and what they aspire to — say, a Ph.D. in Literature or yes, even to fill out an employment application. When you start with the foundations, basic skills such as organizing, categorizing, comparing and contrasting (sounds like English buzzwords) the rest will surely follow as long as the teacher is competent, creative and fully dedicated to her students and mission. As for the math standards, I really don't know. I'm not mathematically inclined . . . but in high school I went as far as algebra and geometry and that was good enough for me. A student may not want to become a professor of partial differential equations, but we all have to balance our checkbooks.

*Table continues.*

Table 3 □ Continued.

Thread	Professor	Student
Th6	<p><i>Let me ask you from the other side: How do you meet 4th grade standards with all student with special needs? Your response makes sense, but it doesn't confront the basic dilemma of what to do when children aren't able to meet all the standards for their age/grade level. Do we water them down? Redefine them? Meet them later?</i></p>	<p><i>In my opinion that is more easier achieved with students with special needs because of the IEP and the way that the educational system is set up for them. We can exempt them from the test or have testing modifications or even re-test later. We get to help decide their goals for the future and put forth whatever effort needed to try to meet them. — One of the hardest things I had to learn in my elementary student teaching is "not to get involved". In special education classes we got to know the parents and the history of the students — we knew "everything" about the student from their test scores to their socio-economic level. We knew their strengths and weaknesses, and planned what to do to meet their needs.</i></p>

that student's reply. All student posts in the lower order forums (Th1, Th2, Th3) are reasoned, whereas none in the higher order forums (Th4, Th5, Th6) are reasoned. The posts that we selected are representative of their respective categories. For example, the student posts from Th1 to Th3 are typical of reasoned posts in lower order argumentative forums.

Focusing on the professor-then-student portion of these threads allowed us to explore possible content patterns that may explain the significant interaction. In all six of the professor's posts, he is challenging—pointing out areas of contradiction, asking students to further support their positions. For instance, in Th1 he asks the student to explain the types of political influence present at the state level, and in Th3 he suggests another interpretation to the issue of standards-based curriculum. Similarly, in Th5 the professor asks the student to define *functioning successfully*, and then support the definition.

All three of the student posts in the lower order forums in Table 3 (Th1–Th3) are reasoned. For instance, in Th1, the student employs metaphor and analogy in describing a hypothesis regarding political influence. Similarly in Th2, the student compares and contrasts two different curricula in an effort to address the professor's question. Finally, the student in Th3 employs an if-then argument, and also attempts to examine different aspects of the issue by adding a twist to the topic. Common to all of these posts is that the students appear secure in

expressing their own views. This confidence also shows in their willingness to admit that they are not clear in their viewpoints or are considering the issue for the first time.

The responses of the students in the higher order forums (Th4–Th6) are not reasoned. All three students avoid making decisions by giving credence to both of the options the professor proposes in his questioning. In Th4, the student seems to agree with both changing and keeping the standards the same, and in Th5, the student endorses both of the options the professor gave for the definition of functionally successful. In addition, all students end their posts with a description or story about their teaching experience. In Th5, for instance, the student describes attitudes toward and experiences with mathematics in high school, and in Th6, the poster talks about experiences with student teaching.

In an attempt to ascertain the reason for these different patterns, we explored further the content of the professor's posts. The only difference of note was that his higher order postings tend to be abstract and the lower order concrete. For instance, in Th4, Th5, and Th6, respectively, he refers to (a) "changes in society and changes in knowledge," (b) "the depths of human creativity . . .," "social utility," and (c) "confronting the basic dilemma . . ."

Conversely, the professor's lower order postings seem more concrete, and closer to the student's individual perspective. He still challenges students, but in a way that does not require them to take into account issues greater

than their immediate environment. In Th3, for instance, the professor talks about goals being more “universally accepted,” but he does not tie them to a society—he does not ask the student to respond to his query from a perspective detached from personal experience.

The present data are too limited to draw conclusions, but it is possible that the students may have had difficulty reasoning in the higher order forums because of the abstractness of the professor’s probes for elaboration. This possibility is consistent with what might be expected from a sociocultural perspective of learning. When confronted with complex issues that are new, students may need additional scaffolding from the instructor. In such learning situations, the instructor constantly assesses a student’s level of understanding of the task or construct involved. Consequently, instruction often involves multiple instances of rephrasing and stepping back, in an effort to move forward. In a face-to-face discussion environment, the professor has multiple opportunities or cues to permit spontaneous and formative evaluation of student understanding in order to make adjustments to instruction. The separation of both time and space that is present in distance learning environments may inhibit this ability. The fact that the student posts in the more complex (higher order) forums were more descriptive and factual than those in the lower order forums may be indicative of their need for additional scaffolding.

## CONCLUSIONS

This study was designed to examine the ways in which instructors can facilitate critical discourse in discussion boards. Interpretation of the findings is subject to certain constraints, many of which are due in part to the nature of the asynchronous learning environment. Most notable is the fact that researchers must make assumptions about understandings and cognitive processes based solely on student posts. In addition, because of the small sample size and the use of five posts as a minimum guideline, the amount of data available for analysis was limited. However, this is one of few empirical investigations

of its kind focusing on the distance-learning environment. The findings therefore should be useful in guiding future research on the topic.

In summary, we found a significant relationship between the stance the instructor takes and the extent of both referencing and reasoning in student posts. Regardless of topic level, the instructor can facilitate student use of references in their posts by adopting a challenging stance. The effect for reasoning appears more complex. The professor’s use of a challenging stance can have a positive effect, but the effect seems limited to instances in which forum topics are lower order.

We do not interpret these results as suggesting that professors construct only lower order topics for online discussion. Rather, we believe that the significant interaction in this study both echoes and refines calls for additional research in the quality of interactions on discussion boards, and the relationships between and among online discussions, constructivist pedagogy, and student learning.

In this study, students created reasoned posts at the start of threads, lending credence to the assertion that the asynchronous nature of the communication allows individuals the time to compose their thoughts. However, our findings also suggest that this reasoned posting is not maintained when the bulletin board generates to a *discussion* (posting back and forth).

This pattern is consistent with the assertion that asynchronous discussion may be fundamentally different from face-to-face discussion in some ways (e.g., Kanuka & Anderson, 1998; Pincas, 1998; Thomas, 2002). Therefore, in distance environments the nature of instructional techniques for scaffolding may need to be reconceptualized. To accomplish this, educators propose focusing on variations of interfaces to constrain the discussion and scaffold it toward reasoned discourse, assigning to students specific roles to play in discussion, and couching discussion in the context of problem-based learning (e.g., Cho & Jonassen, 2002; Hara, Bonk, & Angeli, 2000; Hewitt, 2003). For example, Collaborative and Multimedia Interactive Learning Environment (CaMILE) utilizes a feature in which students categorize the nature of each of their posts, such as a rebuttal to a previous post,

or an alternative (Hmelo, Guzdial, & Turns, 1998).

Our results add to these suggestions by highlighting the importance for the instructor in crafting responses to an appropriate level of abstractness for each student. This study also supports use of an interface such as that of CaM-ILE, to the extent that it may help students focus on constructing reasoned posts. We contend that attention must also be given to instructional techniques to assist students in recognizing and developing reasoned discourse. Modeling may not be enough in this environment. In our study, despite the instructor's consistent use of reasoning in challenging forums (and encouragement for the same among the students), the majority of student posts were *not* reasoned. This may be another indicator of the differences between face-to-face and asynchronous discussion. In the former, the instructor can take advantage of "teachable moments" that occur by explicitly pointing out to all when an individual student constructs a reasoned argument. Thus, in the face-to-face classroom, there is both explicit and implicit support for students in developing reasoning abilities. Instructors may wish to explore how explicit support can be realized, particularly at the class level, in an asynchronous environment.

To determine what techniques may be effective, we suggest that research first focus on exploring how students interact with messages in threaded discussion. Studies using think-aloud protocols, interviews, and observational techniques to ascertain how students engage with the discussion board may be vital in this pursuit. Contextual factors such as gender, prior experience, and motivation should be explored as well. A fuller understanding of students' posting behavior as it is a reflection of their engagement with the discussion board will not only assist instructors in facilitating reasoned discourse on bulletin boards, but also add to the research into other computer-mediated environments.

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