A Study of Time Limit Structures on Participation Flow in an Asynchronous Discussion Forum

Timothy Ellis and Laurie P. Dringus
Nova Southeastern University email: ellist@nova.edu; laurie@nsu.nova.edu

Abstract – The need for increased instructor involvement and teaching presence in an asynchronous discussion forum has received prominence in the literature. Less known is the influence of the online instructor in structuring online forums to facilitate meaningful student participation and interaction. This study explored how the use of time structures established by the instructor moderates the flow of topic discussions in a forum. The study utilized five metrics – density, intensity, latency, responses, and a composite ‘wellness index’ – to compare the patterns of discussion forum activity derived from graduate-level courses offered with two different instructor management approaches. In one set of five courses, the instructor utilized a time-structured style, in which discussion topics were identified at the beginning of the term and students had 21 days to contribute to each topic. In the second set of five courses, the instructor presented the topics gradually during varied time periods of the course of the term and imposed no specific deadlines for students to contribute. Although preliminary, the findings of the study indicate that the instructor’s management style of introducing topics in an online course influences the flow of the discussion.

Index Terms – Asynchronous learning networks, community of inquiry, discussion forums, teaching presence

INTRODUCTION

The asynchronous learning network (ALN) is the most prominent medium of online instructional delivery [1-3]. Particularly within the asynchronous online discussion forum, the prominent role of the instructor in an online course is demonstrably vital to the facilitation and engagement of students in the course. Studies have shown the need for the instructor to engage students effectively in meaningful dialogue exchange [1-5], to establish teaching presence in promoting learning and a sense of community among students [5, 6], and to provide effective instructional strategies to support students’ engagement in critical thinking [1-3, 5, 6]. For example, Durrington and Yu [4] described the importance of the manner in which the instructor organizes educational activities and moderates discourse. Instructor involvement influences the level of student engagement in the learning environment [4, 7] and the extent to which a community of learners is established [3, 5].

Less known is the influence of the online instructor in structuring online forums to facilitate meaningful student participation and interaction. The instructor’s management style in moderating an online discussion has not been studied extensively, particularly the time structures under which online discussions are managed. The extent the instructor’s presence in the forum is either beneficial or ineffective in engaging and sustaining student participation in the forum has not been adequately explored. One study [4] suggested that allowing the students to direct the forums themselves results in promoting significantly greater student participation in the discussion than in those directed by the instructor, while active involvement in and control of the environment by the instructor has been shown in another study [3] to have a beneficial effect on the development of a functioning learning community.

Problem Statement

The instructor’s role as facilitator and moderator in a discussion forum has been addressed on a descriptive level [4, 5], but not as extensively on showing actual patterns of discussion flow by students that may be induced by the instructor’s preferences for establishing topics and time frames for discussion. This study explored how the use of time structures established by the instructor moderates the flow of topic discussions in a forum.

Goal and Research Question

The goal of this study was to examine how time structures imposed by the instructor in an online discussion forum affect how students respond to topic postings and the rate of momentum retained on topic discussion. Often instructors will establish time limits for which topics are open for contribution and discussion. Some instructors do not define time limits on topics, leaving them open indefinitely for contribution and discussion. This study included time patterns from two activity views: one online course discussion forum where structured topics were posted with an imposed time limit for discussion and another online course discussion forum with structured topics posted without time limits, leaving the topics open indefinitely for discussion. These forums were examined to reveal patterns in discussion flow with duration as the main measure, and with primary focus on density, intensity, latency, and response count to represent time transitions in various contexts. A causal-comparative study determined the extent to which time limit structures imposed by the instructor had
on the overall vitality or wellness of discourse in an asynchronous discussion forum. The research question of interest for this study was:

How does the structure of the topic discussion imposed by the instructor (time-limit or no time-limitation) affect the density, intensity, latency, response count, and overall wellness of discourse in an asynchronous discussion forum?

BACKGROUND

Teaching Presence
The community of inquiry model proposed by Garrison, Anderson, and Archer [6] is commonly cited as a method for describing, analyzing, and evaluating the educational experience in an ALN. Three factors comprise the model: social presence, cognitive presence, and teaching presence. Teaching presence is receiving increased attention in the literature [1-3]. Teaching presence has been deconstructed into three elements, each of which contains a number of factors [1, 3], including:

- Instructional design and organization
  - Communicating course goals
  - Leading how to engage in learning activities
  - Communicating due dates and time frames
- Facilitating discourse
  - Guiding class toward agreement
  - Acknowledging student participation
  - Encouraging student exploration
- Direct Instruction
  - Presenting content
  - Focusing discussion
  - Providing explanatory feedback

This study falls within the “Instructional design and organization” element and focuses primarily on examining alternative approaches to “Communicating due dates and time frames”.

Measurement

A number of approaches have been utilized to measure teaching presence [2] including survey-based evaluations of student perceptions about teaching presence [1, 3]. Another notable method is through an examination of individual postings from a threaded discussion forum to determine presence of discourse-level indicators [8]. The first approach often lacks precision and granularity, while the second requires exhaustive, subjective analysis of a large corpus of postings.

A third approach for measuring the educational experience is to mine the logs from the computer-mediated communication instruments. The data is derived from the transcripts from the threaded discussion forums [9]. Research based on this data mining process has produced a number of potentially valuable indicators.

Density. Density can be defined as the raw number of postings made to a given discussion topic within a given period of time. This indicator has been used to measure the impact placing time limits on discussions has on the level of interaction [4] and to measure when discussions progress to a higher level of activity [10].

Intensity. Intensity can be defined as the length of time that elapses between postings made to a given discussion topic. This indicator has been used to measure the level of interactivity in a discussion based on day of the week [11] and to explore the level of collaborative argumentation [12, 13].

Latency. Latency refers to the length of time elapsed between a posting and a direct response to that posting. It has been used to study the impact of the day of the week on the momentum within a discussion topic [10].

Response count. The number of responses spawned by a posting [14] has been used to examine level of interactivity by day of the week [11].

RESEARCH METHODS

A causal-comparative methodology was followed to derive an answer to the research question driving this study. Two hypotheses were tested to develop an answer to the research question:

H(1) Regardless of the presence or absence of instructor-imposed time structuring on the discussion topic, the patterns of discourse as illustrated by the measurement of density, intensity, latency, response count, and a composite “wellness-index”, will be linear and predictable.

H(2) There will be no difference in the patterns of discourse as illustrated by the measurement of density, intensity, latency, response count, and a composite “wellness index”, based on the time-structure on the topic discussion imposed by the instructor (time-limited or no time-limitation).

In developing answers to the research questions, the following data were extracted from the transcripts of the discussion threads:

1. Start Date – The date the instructor initiated the discussion by either presenting the topic or opening a previously presented topic for student contribution
2. Day-In – The number of days subsequent to the Start Date on which the posting was made.
3. Density – The count of the postings made by students and instructor.
4. Intensity – The average length of time between postings on a given Day-In the thread or day of the week. To make the slope for these data consistent with the slope for Density (i.e. a high number indicating higher performance), the reciprocal of average time between postings was used, since a
larger length of time between postings would in fact indicate poorer performance.

5. Latency – The average length of time between when a response posting is made and when the initial posting was made. As for Intensity, to make the slope for these data consistent with the slope for Density (i.e. a high number indicating higher performance), the reciprocal of average time between when a response posting is made and when the initial posting was made was used.

6. Response count – The number of postings made in response to a given posting.

7. Wellness-index – A composite figure incorporating Density, Intensity, Latency, and Response count to indicate an overall picture of the level of discussion forum activity for a given Day-In. Since the component variables were based on differing scales, the raw scores for each variable was converted to a percentile.

The data necessary to test the hypotheses were derived from the threaded discussion forums from two sets of courses. The test data (TD) were derived from five instances of a course in database systems offered by a single instructor in a graduate school of computer and information sciences over a three-year period. Each course offering featured the same discussion forum assignment that entailed participation in a series of two topics over the 12-week term. Both topics were introduced by the instructor at the beginning of the term and allocated consecutive 21-day time frames for discussion, creating a time-structured environment. The comparison data (CD) were derived from five instances of a course in human computer interaction offered by another instructor in the same graduate school over the same three-year period. Each course offering featured the same discussion forum assignment that entailed participation in a series of 10 topics over the 12-week term. The instructor introduced the topics throughout the course of the term, but no time limits beyond the natural end-of-term limit were placed on participation in the discussion of the topic.

Assumptions, Limitations and Delimitations

This study was designed to be exploratory in nature and should be viewed in the context of the assumption that the 10 class offerings that comprised the subject set are representative of a meaningful subset of students participating in a program of study delivered via an online modality. It is important to note that the researchers used archived discussion transcripts through which data, drawn from a historical view, only support research questions of a reflective nature. The variables used in the study were limited to data that were extractable from the transcripts, limiting the researchers to explore patterns that could not be linked to a definitive scale of quality. The study did not employ current courses to perform a predictive study of possible temporal patterns with the use of control and experimental groups. Finally, the study was delimited to only information systems students at the graduate level, thereby limiting generalization to other populations.

Data Analysis

To test hypothesis H(1), the Day-In values for Density, Intensity, Latency, Response count, and Wellness-index for both the TD and CD data sets were analyzed by using an ANOVA to calculate the goodness of fit of the actual scattergram of Day-In figures for each of the variables to a linear regression line calculated for the distribution. The assumption underlying this analysis was that those variables that produced scattergrams that were closely grouped around the regression line displayed a linearity that afforded predictability.

To test hypothesis H(2), the Day-In values for Density, Intensity, Latency, Response count, and Wellness-index were analyzed by comparing the values from the TD set with the associated values from the first 21 days of activity for each topic in the CD set using a Pearson’s r. The assumption underlying this analysis was that a strong correlation would be counter-indicative of a difference in the patterns of discourse exhibited in the two time structure styles.

RESULTS

The number of postings included in these data was significant. The TD data set included a total of 1711 student postings for an average of 7.6 postings per student for each of the two topics per course. There were 343 instructor postings in the TD set for an average of 34 per topic per course.

The CD data set included a total of 1791 student postings for an average of 1.65 postings per student for each of the 10 topics per course. There were 709 instructor postings for an average of 14 per topic per course. The topic durations ranged from 8 to 76 days, with a mean length of 33.6 days. Almost half (44.8%) of the threads were open for between 11 and 30 days. A review of the posting Density by Day-In revealed that, on average, 50% of the postings were made in a given thread by seventh day, 75% by the twelfth day, 90% by the twenty-first day, and 95% by the thirty-first day.

Hypothesis H(1)

As illustrated in Table I, in the case of the CD classes, all five variables produced statistically significant values indicating rejection of the null hypothesis of non-linearity.

<table>
<thead>
<tr>
<th>Variable</th>
<th>df</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density</td>
<td>1</td>
<td>19.432</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Intensity</td>
<td>1</td>
<td>66.175</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Latency</td>
<td>1</td>
<td>254.787</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Response count</td>
<td>1</td>
<td>23.002</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Wellness-index</td>
<td>1</td>
<td>457.283</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>
As displayed in Table II, the TD classes produced mixed results; only the Latency variable produced a statistically significant value to indicate rejection of the null hypothesis of non-linearity.

**Table II**

<table>
<thead>
<tr>
<th>Goodness of Fit: Test Data Set</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable</td>
</tr>
<tr>
<td>Density</td>
</tr>
<tr>
<td>Intensity</td>
</tr>
<tr>
<td>Latency</td>
</tr>
<tr>
<td>Response count</td>
</tr>
<tr>
<td>Wellness-index</td>
</tr>
</tbody>
</table>

**Hypothesis H(2)**

As suggested by the data resulting from the goodness of fit analysis displayed in Tables I and II, the tests for correlation produced mixed results. Statistically significant correlations were noted for Latency ($r=0.554$, $p=0.007$) and Response count ($r=0.570$, $p=0.006$). Density ($r=0.055$, $p=0.807$), Intensity ($r=0.131$, $p=0.561$), and Wellness-index ($r=0.272$, $p=0.220$) did not record statistically significant results. Figure 1, which tracks the average percentile ranks on the composite Wellness-index by the Day-In for both the TD and CD courses, graphically illustrates the differences in patterns discourse suggested by correlations described above.

![Figure 1](comparison_of_wellness-index_values.png)

**CONCLUSIONS AND FUTURE RESEARCH**

As indicated by the results of the test of the first hypothesis, the patterns of discourse in discussion forums that did not have an instructor-imposed time limit appear to be linear and predictable in nature. The same patterns, however, are not linear or predictable in discussion forums that had an instructor-imposed time limit. The imposition of time structure by the instructor does appear to impact the natural flow of discourse. This observation is reinforced by the results of the testing of the second hypothesis. The imposition of time structure by the instructor changes the pattern of discourse within a discussion forum in a manner that is perhaps analogous to how the imposition of structure in a debate impacts the flow of discourse.

It is important to view these observations in the proper context. This study examined the patterns, not the quality of discourse. Quality of discourse is much more difficult to define but certainly includes both cognitive and social elements [6] as indicators of the overall vitality or wellness of the interaction.

The concept of wellness must provide the online instructor with the capability of gauging if a discussion topic has lost its impact and become stale. The instructor should be able to see shifts in topic discussion and the value of those shifts as represented by time delays or time accelerations in discussions. The instructor should be able to gauge the wellness of the discussion and use that information to support a variety of goals, including reaching a desired level of critical inquiry [1, 3, 6]. For example, if more time necessitates reflection on the content, the instructor could use time to direct new transitions.

Future studies should continue to explore the value of wellness and topic shifts in comparing time structures or deadlines imposed by the instructor to discussions that have no imposed no time structures or deadlines. Future studies should also include a qualitative analysis of postings to determine differences across all community of inquiry indicators (i.e., teaching, social, cognitive) based on the time structure and moderator style of the instructor. Finally, a qualitative evaluation of the discussion thread activity may reveal differences in the attainment of associated learning outcomes based on the time structure and moderator style of the instructor.

**REFERENCES**


[4] V. A. Durrington and C. Yu, "It's the same only different: The effect the discussion moderator has on student participation in online class discussions," *The Quarterly Review of Distance Education*, vol. 5, p. 11, 2004.


[8] K. D. King and T. J. Ellis, "Comparison of social presence in voice-based and text-based asynchronous computer conferences," in *Hawaii International...*