Evaluating Online Conversation in an Asynchronous Learning Environment:

An Application of Grice's Cooperative Principle

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ABSTRACT

This study goes beyond student perceptions of online learning experiences, satisfaction, and attitudes, to examine the actual participation and dynamics that occur in online discussions and their relationship to student learning outcomes. A content analysis approach was used to investigate students' socio-cognitive processes in an online graduate-level English grammar class. Student postings were rated using a newly developed Gricean Cooperative Principle scoring rubric to assess student participation as determined by four maxims: Quantity, Quality, Relevance, and Manner. Results suggest that Quality is the most important criterion for predicting direct responses to a posting. Students with high average Quality scores also received higher final course grades than did their counterparts. In addition, students with high scores for Manner earned higher conference grades than did their counterparts.

I. INTRODUCTION

Asynchronous communication has become the dominant delivery mode for online instruction, as it is convenient for both students and instructors to participate in class discussions at any time, from any location. Computer-mediated online discussion has long attracted the attention of researchers precisely because it is significantly different from face-to-face discussion in traditional classrooms. In online discussion, for example, all students have a voice and no one, not even an instructor, can dominate the conversation. Accordingly, many researchers note that students perceive online discussion as more equitable and more democratic than traditional classroom discussions (Harasim, 1990; Levin, Kim, & Riel, 1990). Because it is asynchronous, online discussion also affords participants the opportunity to reflect on their classmates' contributions while creating their own, and to reflect on their own writing before posting it. This creates a certain mindfulness among students and a culture of reflection in course discussions (Garrison, 2003; Hiltz, 1994; Poole, 2000).

Although many researchers have investigated a variety of aspects of online discussion (Anderson, Rourke, Garrison, & Archer, 2001; Gunawardena & Zittle, 1997; Picciano, 2002; Richardson & Swan, 2003; Swan, 2002; Tu, 2000; Walther, 1994), the quality of students' participation in an asynchronous online learning environment and of the interactions between students and their instructors and peers in this environment have not been thoroughly investigated. In particular, researchers have not definitively linked the quality of student participation in course discussion to their performance in online courses. This study aims to answer some critical questions with respect to the participants' socio-cognitive processes in the asynchronous learning environment, focusing on the quality of communications among

participants, and, importantly, the links between that quality and student performance. It does so by revisiting research on interactions in traditional, face-to-face, classrooms.

II. BACKGROUND

It has been suggested in previous studies that the analysis of transcripts from asynchronous online communications could give insight to the actual, as opposed to perceived, learning that takes place in this environment (e.g., Henri, 1992; Hiltz, 1990; Mason, 1992). Indeed, a good deal of research on online discussion has focused on such content analysis, in part, of course, because the written discussion transcripts are in some sense "low hanging fruit."

For example, several studies have employed content analysis to explore the way participants develop "social presence" in online discussions (Rourke, Anderson, Garrison, & Archer, 1999; Swan, 2003; Swan & Shih, 2005; Tu, 2000), and survey-based research has linked student perceptions of social presence to student satisfaction and perceived learning in online courses (Gunawardena & Zittle, 1997; Picciano, 1998, 2002; Richardson & Swan, 2003). Attempts to link perceived social presence to student performance, however, have been at best suggestive (Picciano, 2002; Swan & Shih, 2005).

Similarly, content analysis has been used to describe "teaching presence" in online discussions (Anderson, Rourke, Garrison, & Archer, 2001), and survey-based research has linked student perceptions of teaching presence to their satisfaction and perceived learning (Shea, Pickett, & Plez, 2003) in online courses. Teaching presence has not been linked to student performance.

Content analyses which explore online discussion for "cognitive presence," for evidence of critical thinking and knowledge construction, have been somewhat less successful. For example, Henri's (1992) model of online discourse included categories for identifying cognitive and metacognitive behaviors, but has been widely criticized for the difficulty in applying its units of analysis. Other models such as Gunawardena, Lowe, and Anderson's Interaction Analysis (1997) and Garrison, Anderson, and Archer's Community of Inquiry (2001) models have been more useful in their application, but such application has yielded disappointing results.

The nature of the communication style in asynchronous threaded discussions is "hybrid" (Murray, 1995); it contains a mixture of the features of both oral conversation and written communication. In an asynchronous threaded discussion, participants have time to ponder, compose, or reply to messages in a time-delay communication mode. Hence, the final appearance of their messages is similar to formal writing. With more time to think about a composition (Garrison, 2003), these messages appear concise and relevant, and with greater attention paid to accuracy and technical details such as spelling, punctuation, grammar, and organization. At the same time, asynchronous communication tends to be less formal and more personal in style than formal academic writing, and it importantly retains some sense of the dialogic quality of oral conversation. As asynchronous online discussion seems to combine elements of both oral and written communication in traditional classrooms, it may be useful to revisit the extensive socio-cognitive research examining oral classroom communications.

In the traditional classroom setting, the importance of socio-collaboration and the dynamics of oral discourse among and between students and their instructor have been well documented by psychologists and educational researchers (Bruner, 1983; Cazden, 1988; Nystrand, Gamoran, Kachur, & Prendergast, 1997; Vygotsky, 1978). A good deal of research on oral discourse is based on Grice's (1989) Cooperative Principle (CP) theory, which may also be applied to classroom discussion (Applebee, 1996; Forman & Larreamendy-Joerns, 1998; Levy, 1999). Grice developed his theory as a way to explain the processes that sustained or interrupted typical spoken conversations. Its basis is the argument that for conversation to be sustained, participants must cooperate in sustaining the discourse. Grice also believed that some direction or social goal was necessary for a meaningful exchange of information or communication. He outlined four conversational elements: Quantity, Quality, Relevance, and Manner, claiming that speakers need to attend to each for conversation to be successfully sustained. Researchers in the fields of communication, linguistics, education, and cognitive psychology have extended and critiqued these four maxims and developed additional work based on Grice's theory (Applebee, 1996; Green, 1996; Horn, 1998; Mey, 2001; Penman, 2000; Sperber & Wilson, 1995). Grice's CP theory parallels the general objectives of a socio-collaborative learning environment in that learning is a social activity and all learners think, explore, and express their perspectives during the learning process. In order to examine how this discourse occurs during the learning process, one can study these four maxims and interpret how they may guide online instructors to better facilitate online discussions, evaluate students' thought processes, and help promote learning in the asynchronous environment.

One goal of the study reported in this paper was to assess the degree to which each contribution to the threaded discussions was likely to be successful in sustaining the ongoing conversation. Although Grice's CP theory has been analyzed and critiqued by other linguists and communication theorists (Horn, 1998; Mey, 2001; Sperber & Wilson, 1995), the thoroughness and the social aspect of his principles of successful communication are applicable to the online interactions in the present study. Since social interaction in online course discussions retains important characteristics of oral communications, Ho (2004) adapted Grice's theory to analyze the resulting discourse for the present study. These Gricean elements, adapted to the online environment, are as follows:

Quantity: The posting provides as much information/material, as is necessary, and no more.

Quality: The posting is a new contribution, reflective of the student's belief and/or opinions, and is supported by sufficient evidence where necessary.

Relevance: The posting is on the same topic, and follows a natural conversation from either the conference topic or previous posting, whichever is applicable.

Manner: The posting is logically organized and clearly presented.

The purpose of this study was to investigate socio-cognitive processes in asynchronous online course discussions. A specific focus of the study was to explore relationships between Gricean elements in students' discussion postings and sustained discussion, as well as relationships between Gricean elements in students' discussion postings and their course performance. The following hypotheses were tested:

1. A positive relationship exists between a posting's Gricean ratings (i.e., Quantity, Quality, Relevance, Manner, and Total Score) and the number of direct responses to that posting.

2. A positive relationship exists between a student's average Gricean ratings (i.e., Quantity, Quality, Relevance, Manner, and Total Score) and the average number of direct responses generated in response to that student's postings.

3. A positive relationship exists between students' average Gricean ratings and their conference and final course grades.

4. A positive relationship exists between the total number of students' online contributions and their conference and final course grades.

III. METHODOLOGY

A case study approach was utilized in this research for several reasons. First, it has been argued that a case study approach is appropriate for small sample sizes in online courses (Lee & Bowman, 2002). In addition, the present study aims to examine learning processes, specifically, socio-cognitive interactions in online asynchronous discourse. Although the study considers learning outcomes in relation to these, its focus is on those elements of online discussion that sustain discourse. Moreover, the study is exploratory in nature, in that the applicability of elements developed to explain spoken interaction to text-based, asynchronous online interaction is considered. Here, quantitative content analysis is employed to explore relationships between the qualities of students' discussion postings, sustained discourse, and student performance in an online course. An examination of the subjects, instruments, procedures, and data analysis techniques used in this study follows.

A. Subjects & The Online Course

An online English grammar course was the case investigated in this study. The majority of the students enrolled were graduate students in the TESOL master's program at a public research

university in upstate New York, who were required to take the class as part of their degree requirements. A total of 15 students enrolled in the online course. In addition to 12 modules of content material, the course involved 5 course conferences in which students were asked to discuss issues related to linguistics or language learning and teaching. Students responded to each conference topic as well as other students' postings during the discussion timeline. Students had approximately two weeks to participate in the threaded discussion for each topic. The course instructor's grading policy and expectations were as follows:

> Every two weeks I will post a topic for discussion in the course's **conference area** (found after the last module). There will be five in all. Each will be kept open for two weeks. You should visit each conference several times while it is open, posting your own comments and responding to those of others. Good postings will be *substantive:* more than just "I agree," for example. (Of course, if you do agree, you can say why you agree -- which makes a substantive response.) A **minimum of two** relevant and reasoned postings per conference is considered *average* (equivalent to a grade of C).

In addition to the conference discussions, other course requirements included reading responses, exercises, and several writing projects. The reading responses and exercises were based on the required readings from each learning module. Writing projects included a movie review, a practical exercise, and a research paper. While reading responses dealt with "comments or questions reflecting on the material in the required reading assignment," the writing projects focused on the application aspects of language and linguistic issues. Table 1 summaries the course learning activities and assignments and how each requirement was weighed to determine a final course grade.

-- Insert Table 1 here --

As shown in Table 1, students' final course grades were heavily based on written

submissions (all assignments except Reading Exercises). Therefore, it makes sense to

examine how students composed their online discussion postings in terms of their critical

thinking skills and cognitive processes, and to compare that learning outcome to their

final course grade. Students' contributions and comments in the online discussions may

serve as evidence of their thought processes.

B. Instrument & Procedures

A Gricean rating rubric (see Appendix) was used to code all student postings for each of the four

elements on a scale of 0 (low) to 3 (high). A total of 512 postings were recorded in the online

class. Hard-copy transcripts of online discussions were coded by two raters during the pilot

study (Ho, 2004). Discrepancies between raters were resolved by consensus. However, one

author of this paper was the only rater to code all postings for the final analyses. Gricean ratings

were assigned for each element and tallied to give a total Gricean score for each posting. In

addition, these were averaged across postings to calculate an average for each element and an

average total score for each student.

The total number of responses to each posting were also collected and averaged across postings to calculate an average number of responses for each student. In addition, students' conference (discussion) and course grades were collected, as were the total number of messages they posted to the discussion board.

C. Data Analysis

To test the first two hypotheses, Pearson correlations were calculated to determine the relationship between students' ability to communicate effectively through their postings (i.e., Gricean scores of their postings) and the number of responses their postings generated. A multiple regression analysis was also used for Hypothesis 1 to explore which Gricean elements predicted the number of responses generated. To further explore Hypothesis 2, students were ranked by the average Gricean ratings of their online postings and placed into three Gricean groups (High, Moderate, and Low). An analysis of variance (ANOVA) was conducted to compare the mean responses generated among the three groups.

To test the third hypothesis, students' grades (both conference grades and final course grades) were compared to students' Gricean scores using correlation analysis. In addition, students were ranked by the average Gricean ratings of their online postings and placed into three Gricean groups (High, Moderate and Low). If the correlation results indicated a significant relationship between two variables, a one-way ANOVA test was conducted to compare the difference in mean performance (grades) among the three groups. To test hypothesis 4, Pearson correlations were calculated to determine the relationship between students' total number of online contributions and their conference and final course grades. In addition, students were ranked by their total contributions and placed into three contribution groups (High, Moderate, and Low). A

one-way ANOVA test was conducted to test for significant differences between the three groups in terms of their conference and final course grades.

IV. RESULTS

In the following sections, results are given by hypotheses:

Hypothesis 1: A positive relationship exists between a posting's Gricean ratings (i.e., Quantity, Quality, Relevance, Manner, and Total Score) and the number of direct responses to that posting.

Gricean scores and the number of direct responses for all 512 student postings from the online class were coded. Correlations were calculated to determine the relationship between a postings' Gricean ratings and the number of direct responses. Table 2 shows that there was a significant positive relationship between a posting's Gricean ratings and the number of direct responses generated by that posting. The number of direct responses generated by each posting was significantly correlated with posting Quality, Relevance, Quantity, and Total Score. The finding for Total Score indicates that Hypothesis 1 is supported. The strongest correlation found was between posting Quality and direct responses, suggesting that participants were most likely to respond to new, substantive contributions that expressed beliefs or values.

-- Insert Table 2 here --

In addition to the correlation tests, a multiple regression test was performed to determine which Gricean elements were predictors of the total number of direct responses for a posting. A significant model emerged ($F = 29.01$; $df = 4, 507$; $p < .0005$); adjusted R square $= .18$. Significant variables were Quality (Beta $= .385$, $p < .0005$) and Relevance (Beta $= .084$, $p = .041$) as predictors of the total number of direct responses generated for a specific posting. Together they predicted 18% of the variance in responses to individual postings, with Quality accounting for by far the greatest amount of the variance. It is also interesting to note, in this regard, the correlations among Gricean scores, with Quality and Relevance being the most highly correlated.

Table 3 shows the average number of direct responses generated as a function of Gricean criterion scores. Postings received a progressively higher number of direct responses with respect to increasing Quality scores (.36, .49, .91, and 1.50, respectively) and increasing Relevance scores (.57, .63, .67, and .89, respectively), showing that postings that were new, personal and relevant received the most responses. The mean number of responses by Manner shows an initial jump from few responses to postings with a Manner score of 0 to a clustering of average responses to Manner scores of 1 to 3. This may indicate a threshold in style below which postings fail to elicit responses.

-- Insert Table 3 here --

Postings which were rated a Quantity score of 1 received slightly fewer direct responses than those rated 0 (.50 and .56 respectively). Some explanation for this can be found in Table 4, which shows the average length and length range of postings for each Quantity score. Postings with a Quantity score of 1 were on average longer messages (11.2 lines) than those messages rated 0 for Quantity (7.8 lines). The results seem to indicate that shorter messages received more responses than longer ones.

-- Insert Table 4 here –

Hypothesis 2: A positive relationship exists between a student's average Gricean ratings (i.e., Quantity, Quality, Relevance, Manner, and Total Score) and the average number of direct responses generated in response to that student's postings.

A student's average Gricean rating is defined as the summation of a student's score for each Gricean criterion (or Total Score) divided by the total number of student postings. The average direct response to a student's posting was determined by dividing the total number of direct responses to a student's postings over the semester by the number of contributions by that student. This has the effect of determining the net direct response to each student. The unit of analysis for Hypothesis 1 was the online posting, while the unit of analysis for this and all other hypotheses was the student.

Table 5 gives correlations between students' average Gricean ratings and the average number of responses to their postings. It shows that the average number of direct responses was significantly correlated with a student's average Quality rating and average Total Score. The results support findings relative to the first hypothesis, indicating that students' whose postings evidenced the greatest Quality were also the most likely to generate the most responses. It is also important to note the significant relationship between students' overall Gricean ratings and the overall responses to their postings. Hypothesis 2 is thus supported.

-- Insert Table 5 here –

In addition, all students' average scores for Quantity, Quality, Relevance, Manner, and Total Score were ranked and divided into three Gricean rating groups (5 students each in Low, Moderate, and High rating groups). A one-way Analysis of Variance (ANOVA) test was used to analyze the mean differences among the three Gricean groups. The fixed, categorical independent variables were the Gricean rating groups (i.e., Quantity, Quality, Relevance, Manner, and Total Score) with three levels (Low, Moderate, and High); the continuous, random dependent variable was the average number of direct responses. This analysis was run for each individual Gricean criterion group.

No significant differences were found for average direct response by Quantity, Relevance and Manner. A significant difference was found for Quality ($F = 4.405$; $df = 2, 12$; $p = .037$). ANOVA linear contrast ($p = .010$, one-tailed) and post hoc Tukey tests indicated that students in the high Quality group received more average direct responses ($\bar{x} = .96$) than those in the low Quality group ($\bar{x} = .59$). Omega squared strength of association indicated that 31% of the variability in students' average direct response could be accounted for by their Quality performance level. Additionally, results from the ANOVA linear contrast test ($p = .019$, one-tailed) revealed that students in the three Total Score rating groups received progressively higher (.69, .75, and 1.04, respectively) numbers of direct responses. The results give additional support to Hypothesis 2 and suggest that students who produced thought-provoking and substantive contributions received more direct responses from others.

Hypothesis 3: A positive relationship exists between students' average Gricean ratings and their conference and final course grades.

Students' conference participation contributed 15% to their final course grade. Table 6 gives correlations between students' average Gricean ratings, their grades for participating in conference discussion, and their final course grades. It shows a significant correlation at the .05 level between students' conference grades and their average Manner score, but no other correlations between conference grades and average ratings for the other Gricean elements or between conference grades and their total Gricean score. The results indicate that in assigning conference grades, the course instructor was most attentive to style issues summarized in this study by Gricean Manner. This is not surprising considering that the class was one on English grammar, but it may be an anomaly that limits the finding to this specific case.

A one-way ANOVA test was used to examine the mean differences in conference grades among the three Gricean ratings groups. No significant differences were found in conference grade by Quantity, Quality, Relevance, or Total Score. A significant difference in students' conference grades was found for Manner ($F = 5.2$; $df = 2, 12$; $p = .024$). ANOVA linear contrast ($p = .004$, one-tailed) and post hoc Tukey tests indicated that students in the high Manner group received significantly higher conference grades from the course instructor ($\bar{x} = 3.72$) than those in the low Manner group ($\bar{x} = 2.94$). Omega squared strength of association indicated that 36% of the variability in students' conference grades could be accounted for by their Manner performance level.

-- Insert Table 6 here –

When final course grades were examined (Table 6), significant correlations between students' final course grades and their average Gricean ratings for Quality, Total Score, and Manner were revealed, indicating a positive relationship between these Gricean ratings and students' final grades and an interesting confluence of instructor ratings and the formulation of student responses. It is also interesting to note the lack of a correlation between conference and final grades.

A one-way ANOVA test was used to analyze the mean differences in final grades among the Gricean ratings groups. No significant differences were found for the final grade by Quantity, Relevance, or Manner. Results from the ANOVA linear contrast test (p = .041, one-tailed) revealed that students in the three Total Score rating groups received progressively higher final grades (3.26, 3.52, and 3.74, respectively). A significant difference in students' final course grades was also found for Quality (F = 5.047; df = 2, 12; p = .026). ANOVA linear contrast (p = .007, one-tailed) and post hoc Tukey tests indicated that students in the high Quality group received significantly higher final grades ($\bar{x}$ = 3.74) than those in the low Quality group ($\bar{x}$ = 3.12). Omega squared strength of association indicated that 35% of the variability in students' final grades could be accounted for by their Quality performance level.

Results concerning the third hypothesis thus present a mixed picture, with Gricean ratings for Manner accounting solely for conference grades, with Quality, Manner and total Gricean scores contributing to final course grades, and no relationship found between conference and final grades. The results may be related to the course topic, English grammar, and are probably unique to this particular case study.

Hypothesis 4: A positive relationship exists between the total number of students' online contributions and their conference and final course grades.

The fourth hypothesis examines the relationship between total number of contributions to the conference discussions and students' grades (both conference and final grades). It thus explores the possibility that student performance in the course might have been related to the number of

contributed postings as well as the formulation of student postings. Table 7 illustrates the

correlations among students' conference grades, final grades, and their total number of postings

to the discussions. It shows a strong correlation between the students' total number of online

contributions and their conference grade ($r = .844$, $n = 15$, $p < .001$), but not between their total

contributions and their final course grades. The number of contributions was a factor in

conference grades, so this was to be expected. The lack of correlation between total

contributions and final course grades suggests the hypothesis should be rejected.

-- Insert Table 7 here –

Additionally, a one-way ANOVA test was used to examine the mean differences among three

contribution groups (High, Moderate, Low). A significant difference in students' conference

grade was found for contribution group ($F = 27.526$; $df = 2, 12$; $p < .001$). ANOVA linear

contrast ($p < .001$, one-tailed) and post hoc Tukey tests indicated that students in the high

contribution group received significantly higher conference grades from the course instructor ($\bar{x}$

$= 3.86$) than those in the moderate ($\bar{x} = 3.18$) and low contribution groups ($\bar{x} = 2.82$). Omega

squared strength of association indicated that 78% of the variability in students' conference

grades could be accounted for by their contribution level. The ANOVA showed no significant

difference in students' final course grades among three contribution groups ($F = .704$; $df = 2, 12$;

$p = .514$). Taken together the results indicate that the number of student postings contributed to

their conference grades, but that the formulation of student postings was a more significant factor in relation to their final course grades.

V. DISCUSSION

The results of this study demonstrate a relationship between Gricean elements in students' online discussion postings and the numbers of direct responses those postings generate, as can be seen in the strong correlations between total Gricean ratings and direct responses. A strong correlation was also found between students' Gricean ratings (e.g., Quality ratings and Total Score) and their final course grades, and between students' Manner ratings and their conference grades. These findings thus suggest an important relationship between the Gricean elements and student performance. This relationship, however, appears complex. Some of that complexity is discussed below in relation to individual Gricean elements as well as in relation to other, possibly confounding, factors explored in this study.

A. Quantity

The findings of this study showed that students tended to respond to shorter, rather than longer, postings. An average posting length of 6.4 lines received both the highest Quantity rating and the most direct responses (see Tables 3 and 4). In an online discussion, students may react negatively to long postings because of the time or patience needed to read and understand the complete text. Additionally, the primary concept behind a lengthy posting may be obscured or may contain too many points for a simple response. For purposes of translating the units of "lines" used in this study to standard units of words, 60 student postings were randomly selected to estimate the word count per line as 19 ± 2 words.

B. Quality

Of all Grice's criteria used to assess online postings, Quality appears to be the most significant element for determining the number of direct responses generated by a specific posting. In general, the significant correlation between Quality and the number of direct responses appears to have been due to the introduction of one or more new concepts that had not been previously discussed in the online conference. In addition, the use of personal opinions and experiences elicited responses by generating debate and discussion. On the other hand, if a posting only repeated what others had already said, for example the following statement was likely to terminate a thread: "I just wanted to say that you worded that perfectly. I agree with you."

Although this holds true for the vast majority of cases, there is one notable exception. As per the revised rubric (see Appendix), postings are assigned Quality score of 0 if inaccurate information is used. There is evidence, however, where inaccurate postings received a large number of direct responses. This can be interpreted to mean that while a high Quality posting can help generate more responses and keep the online discussions going, a low Quality score posting can actually achieve a similar result if the reason for the low score is an inaccurate statement within the posting. An incorrect statement or inaccurate evidence can cause confusion during the discussion process; therefore, direct responses may be generated by discussion members trying to clarify misconceptions or misunderstandings originally introduced by the 0 Quality message.

Finally, a strong correlation was found between students' Quality ratings and their final course grades. In other words, those students who composed substantive postings with accurate evidence/examples to support their claims received higher final course grades from the

instructor. This confirmation of Hypothesis 3 suggests that these students might have produced

the same high-Quality work across all course requirements, resulting in high final grades. Those

students whose contributions in the conference discussions were evaluated as substantive could

be expected to complete other course requirements with original and creative ideas, utilizing

accurate evidence and examples to support their opinions. Therefore, students' average Quality

score becomes a critical predicator of their final course grades. Correspondingly, course

discussions might be a venue for developing students' ability to produce high quality work. This

notion clearly deserves further investigation.

C. Relevance

The results show that the Relevance of a posting was significantly correlated with the total

number of direct responses generated by that posting and contributed to predicting the number of

responses a posting might receive. The overall Relevance of students' postings, however, was

not found to be significantly correlated with the total number of responses they received. Thus,

it might be that Relevance adds to Quality; that is, a substantive comment is enhanced by its

relevance, but that Relevance alone is not enough. Further research in this area, perhaps

involving student interviews, may be warranted.

D. Manner

The results of this study found Manner almost irrelevant to student responses beyond a certain

critical point. That is, grammar and spelling did not seem to matter much as long as a posting

was intelligible. However, postings receiving very low Manner scores received substantially

fewer responses than all others (see Table 3), indicating that there is a point where such things do

matter to discussion participants. Students receiving higher Manner scores were significantly

more likely to receive higher conference grades from the course instructor. It is most likely the

instructor paid extra attention to the technical aspects of students' writing (e.g., grammar, spelling, punctuation, and organization) because the nature of this online course focused on English grammar. This may be an interesting anomaly that should be investigated further. In this vein, it is interesting to note that errors in English grammar or organization in oral discourse are usually tolerated in a traditional face-to-face classroom situation.

E. Conference Contributions and Learning Outcomes

Statistical analysis of the results from this study showed an interaction between student contributions and the conference grade assigned by the course instructor. As predicted in Hypothesis 4, the total number of student contributions was perceived by the instructor as a performance indicator when evaluating conference participation. Since the frequency of student participation was not related to other course requirements, it is not surprising to see that no relationship was found between the number of contributions and the final course grade.

It appears that those students who had higher ratings for Manner and frequently participated in conference discussions also received higher conference grades from the instructor. However, there was no statistical correlation between students who made substantive contributions in online discussions and the resulting conference grade. It is therefore safe to conclude that the instructor did not individually rate students' online postings; instead, the instructor paid attention to the frequency of student conference participation and the written Manner of the online discussion participants.

Those students with higher conference discussion Quality ratings also received significantly

higher final grades. One can argue that the ability to generate high Quality-rated online postings

is an indicator that of a substantive thought process was employed. Further, students who utilize

a substantive thought process when generating an online posting will likely use the same or

similar thought processes when generating other written assignments. The instructor likely

looked at students' overall performance, subconsciously focusing on the Gricean Quality, across

all written assignments (80% of the final grade, see Table 1) and assigned correspondingly

higher grades to those students who exhibited a higher Quality across all written assignments.

This finding may be used for faculty development as a formative assessment tool. Online

instructors can use a discussion evaluation rubric, similar to the one developed for this study, to

better understand and qualify the individual posting and student strengths and weaknesses. This

is equivalent to a continuous assessment of the socio-cognitive processes in which the instructor

can guide the students in an effort to improve learning. In addition, such a rubric may be used as

a summative tool for assigning grades based on learning rather than simple metrics such as

frequency of contribution.

VI. CONCLUSIONS

The asynchronous online learning environment provides a unique mode of learning for both

traditional and non-traditional students. As the world becomes more interconnected, alternatives

to the traditional classroom are becoming more commonplace. Ensuring the quality of the

education offered in these new settings requires new methods of evaluation. One of the most

widely recognized approaches for evaluating verbal communications is Grice's Cooperative

Principle (CP) theory. This study modified and extended this theory to the assessment of

learning in the asynchronous online environment. The application of the CP theory to this

relatively new learning environment was successful in demonstrating a clear relationship between actual learning as measured by multiple performance criteria and rubric scores. A statistically significant, positive correlation was found between the scores assigned to an individual posting based on Grice's CP theory maxims and the ability to generate direct responses. This finding indicates that this theory, when used with the rubric developed for this study, can be used to enable conversation participants to optimize their contributions to the asynchronous online environment. To the extent that contributions relate to performance, and hence learning, Grice's CP theory might be used as a direct assessment of socio-cognitive learning processes in the asynchronous learning environment.

There are several limitations to the current study. Most importantly this is a case study, not a designed experiment. Therefore, results of the present study may not be applicable to other educational levels or subject areas. A good indication of this limitation is in the results concerning conference grades which may be specific to the course topic. Future research should therefore investigate the applicability of the Gricean ratings across courses involving different subject areas and student populations. Researchers in the field of online learning are encouraged to utilize the current version of the Gricean Rating Scale (see Appendix) to assess students' online performance and interaction in online courses, as well as to test its applicability to other courses and student populations. Future research should also include multiple research methods, such as interviews, focus groups, and document reviews, in order to triangulate content analysis data. The content analysis approach in the present study helped the researchers identify some key issues in students' learning processes in online discussions. However, results from the study

could have been interpreted with greater confidence if the study had included interviews, both of students and the course instructor.

Findings from this study have important implications for research and theory on online learning. Most importantly, they link the formulation of discussion postings to students' learning outcomes. These results surely deserve further investigation. Findings from this study may also inform educational practitioners with regard to pedagogical approaches and assessment of online courses. For online instructors, it is crucial to establish discussion guidelines for the students in their online courses. In addition to measuring the frequency of students' participation in online discussions, instructors need to advise students on how to make substantive contributions in conference discussions. The Gricean ratings developed in this paper might form the framework for developing such rubrics. This study might also help program administrators examine important components in the non-traditional learning environment, namely the processes involved in productive online discussion.

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VIII. APPENDIX: COOPERATIVE PRINCIPLE RATING SCALE

	QUANTITY	QUALITY	RELEVANCE	MANNER
3	The amount of information is sufficient to clearly establish the purpose of the posting.	The posting is a <u>new contribution</u> (e.g., novelty, originality), reflective of the student's opinions, *AND* is supported by <u>accurate</u> evidence/examples.	The posting is on the same topic as both the conference *AND* the previous posting.	The posting is logically organized and has no spelling, punctuation, or grammatical errors; meaning of the posting is clearly presented.
2	There is <u>slightly</u> too much or too little information; however, the purpose of the posting is still reasonably clear.	(a) The posting is a <u>new contribution</u> that reflects the student's opinions; however, evidence/ examples are <u>not</u> provided to support claims. *OR* (b) The posting reflects the student's opinions and <u>accurate</u> evidence/ examples are provided.	The posting is on the same topic as the conference, but <u>not</u> the previous posting.	The posting is adequately organized; if any errors are found, they are so minor that the meaning is still reasonably clear.
1	There is too much or too little information, such that the purpose of the posting is occasionally obscured.	(a) The posting is representative of the student's opinions, yet evidence/examples are <u>not</u> provided to support claims. *OR* (b) The posting is largely a re-statement of prior postings *BUT* incorporates a <u>minor new contribution</u>.	The posting is on the same topic as any of the previous postings, but <u>not</u> the conference.	The technical aspect of the posting (e.g., organization, spelling, grammar) has several problems, such that the meaning is occasionally obscured.
0	There is so much or so little information that the purpose of the posting is not understood.	(a) The main idea in the posting is a re-statement of prior postings and <u>no new contribution</u> is present. *OR* (b) <u>Inaccurate</u> evidence/ examples are provided.	The posting is irrelevant to both the conference topic *AND* previous postings.	The posting is poorly organized and/or it has serious errors in sentence structure or usage, thus the posting is hard to understand.

Table 1: Course Learning Activities and Assignment Evaluations

Learning Activities/Assignments	Percentage	Length/Frequency
Reading Responses	15%	A minimum of one screen
Reading Exercises	20%	
Online Discussions	15%	Two postings per conference
Movie Review	10%	4-5 pages
Practical Exercise	15%	5-7 pages
Research Paper	25%	15-20 pages

Table 2: Correlation Matrix of Gricean Ratings and Number of Direct Responses (N = 512)

	Quantity	Quality	Relevance	Manner	Total Score	Direct Responses
Quantity	1					
Quality	.182**	1				
Relevance	.085*	.183**	1			
Manner	.082*	.025	-.045	1		
Total Score	.579**	.639**	.628**	.376**	1	
Direct Responses	.156**	.415**	.160**	.037	.353**	1

* Correlation is significant at the 0.05 level (1-tailed).
** Correlation is significant at the 0.01 level (1-tailed).

Table 3: Means and Standard Deviations for Direct Responses, by Gricean Criterion and Score

Score	Quantity M(SD)	Quality M(SD)	Relevance M(SD)	Manner M(SD)
0	0.56(.89)	0.36(.69)	0.57(.93)	0.50(.53)
1	0.50(.64)	0.49(.66)	0.63(.74)	0.76(.84)
2	0.71(.80)	0.91(.78)	0.67(.82)	0.74(.86)
3	0.89(.87)	1.50(.94)	0.89(.88)	0.80(.81)

Table 4: Means and Ranges of Posting Length, by Quantity Score

Quantity Score	Average (Lines)	Range (Lines)
0	7.8	1 – 62
1	11.2	1 – 40
2	7.9	1 – 26
3	6.4	1 – 18

Table 5: Correlation Matrix of Gricean Ratings and Average Number of Direct Responses (N = 15)

	Quantity	Quality	Relevance	Manner	Total Score	Direct Responses
Quantity	1					
Quality	.252	1				
Relevance	.338	.118	1			
Manner	-.136	.068	.156	1		
Total Score	.533*	.651**	.649**	.518*	1	
Direct Responses	.230	.687**	.317	.011	.545*	1

* Correlation is significant at the 0.05 level (1-tailed).
** Correlation is significant at the 0.01 level (1-tailed).

Table 6: Correlation Matrix of Gricean Ratings & Conference and Final Course Grades (N = 15)

	Quantity	Quality	Relevance	Manner	Total Score	Conf. Grade	Final Grade
Quantity	1						
Quality	.252	1					
Relevance	.338	.118	1				
Manner	-.136	.068	.156	1			
Total Score	.533*	.651**	.649**	.518*	1		
Conf. Grade	-.414	-.218	-.363	.569*	-.127	1	
Final Grade	-.033	.636**	.135	.457*	.567*	.210	1

* Correlation is significant at the 0.05 level (1-tailed).
** Correlation is significant at the 0.01 level (1-tailed).

Table 7: Correlation Matrix of Total Contributions & Conference and Final Course Grades (N = 15)

	Conference Grade	Final Grade	Total Contribution
Conference Grade	1		
Final Grade	.210	1	
Total Contribution	.844**	.102	1

**Correlation is significant at the 0.01 level (1-tailed).