The Relationship Between Student Interaction and Message Readability in Asynchronous Online Discussions

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Abstract: The current study explores the relationship between the readability of computer conferencing messages and the level of student interaction in asynchronous online discussions. Large-scale quantitative analyses were performed on the activity logs of 37 graduate-level distance education courses at the University of Toronto. The mean Reading Ease and Grade Level scores of student messages were found to be significantly correlated with the mean number of messages that students write, the percentage of student messages that reply to other messages, and mean message size. A correlation was also found between the readability of instructor messages and student messages. Consequently, the data suggest that a positive relationship exists between readability and the level of student online interactivity. Possible explanations for these results are discussed.

Introduction and Objectives

The current study examines the readability of messages in computer-mediated conferencing (CMC) courses, and the role that readability plays in online discussions. What relationship, if any, exists between the readability of conferencing messages and online activity patterns? Does writing style affect the volume of messages that students contribute to their online course? Is there greater interaction in courses that have more readable messages? How does the readability of student messages relate to the readability of teacher messages? By exploring these questions it is hoped that we can develop a deeper understanding of some of the factors that promote and sustain collaborative online discourse.

Background

Readability formulas predict the difficulty level of a text using mathematical equations. Two widely used systems for scoring readability are the Flesch Reading Ease score and Flesch-Kincaid Reading Level (Friedman & Hoffman-Goetz, 2006). The Flesch Reading Ease score rates text on a 100-point scale, with lower scores being more difficult to read than higher scores. The Flesch-Kincaid Grade Level formula is similar to the Flesch Reading Ease score, but it is converted to a U.S. grade level equivalent (Friedman & Hoffman-Goetz, 2006). Both algorithms are based on the word and sentence length of a text. Although other types of tests are available, these two are extensively used, in part because they are features of Microsoft Word and are thus easily obtained.

Despite their widespread popularity, readability formulas have been the subject of much academic scrutiny. Klare (1963) identified a number of limitations associated with readability measures. Since readability assessment involves the quantification of textual features, important elements such as word order, content, and organization are left unaccounted for. Redish (2000) suggests this problem is exacerbated by the fact that formulas consider only one or two textual features, usually word and sentence length. Readability may also be dependant on readers' topic preferences, resulting in scores that are highly variable (Dufty, Graesser, Louwerse, & McNamara, 2006), or scores that differ between parts of the same text (Redish, 2000). In spite of these criticisms, many researchers view readability formulas as valuable tools. Of particular appeal is their simplicity and ease of use. Readability measures also serve purposes other than assigning appropriate grade-levels. For example, readability formulas have become standard features on many word processing programs, making it possible for authors to measure the difficulty of a text while still in the process of writing it.

Readability is arguably associated with online CMC culture. Many researchers have explored the importance of community on student interaction in online discussions (Wegerif, 1998; Garrison, Anderson, & Archer, 2001). Romanoff (2003) observes that although online discourse increases the physical distance between conferencing members, "…it can also serve to reduce that distance by enhancing the sense of community among students and teachers" (p. 58). In addition to learning from each other (Brown, 2001) students establish relationships with other members of the class, resulting in feelings of acceptance and well-being (Wellman & Guila, 1999). According to Collison, Elbaum, Haavind, and Tinker (2000), regular participation and a demonstrated concern for

others are hallmarks of a healthy online community. Regular participation is a reflection of open communication, and indicates intellectual trust between participants (Collison, et al., 2000). Message readability would be expected to influence the openness of communication and mutual trust within such a community. However, message readability, which is presumably an important influence on online collaboration and communal development, has not been examined in the research literature. The current study begins to address this issue by examining the relationship between readability and interaction using a large dataset of 37 computer conferencing courses.

Method and Data Sources

Data were collected from 37 graduate-level distance education courses offered at the University of Toronto between January 2003 and December 2005. To be considered for the study, a course had to satisfy several conditions. First, the course had to be delivered purely online, without any face-to-face components. Second, the course had to utilize the course web-based conferencing system Knowledge Forum, which maintains time-stamped logs of student's online activity. Lastly, the central activity of the course had to be participation in the asynchronous discussion forum. Adherence to the preceding conditions ensured that the courses were comparable in design and pedagogy, making it easier to study message readability across courses.

The class sizes in the dataset ranged from 5 to 21 students and all courses were 13 weeks in length. They took the form of a series of weekly seminars in which learners were expected to discuss assigned class readings in a shared asynchronous threaded environment. Fourteen different instructors taught the 37 courses. Web Knowledge Forum records detailed time-stamped logs of each time that an online participant opens or saves a message. The full text of all messages is also preserved. The current study used this data to explore the relationship between the following measures in each course:

1. Readability Measures: Two common measures of readability were adopted for the study: Flesch Reading Ease score (ranges from 0 to 100) and the Flesch-Kincaid Grade Level.
2. Message Count: The message count is the total number of messages contributed to an online course by a student.
3. Interactivity Ratio: The student interactivity ratio is the percentage of messages that a student contributes as "replies" to one of their classmate's contributions. The Interactivity Ratio is calculated for each participant by dividing the number of "replies" by the total number of messages written. A high ratio (a value close to 1.0) suggests a high degree of interactivity.
4. Message Size: The message size is the average size of all messages written by a student, in words.

Course averages were computed for each of the preceding measures by averaging the scores of individual students. Thus, for each of the thirty-seven courses, the following student and teachers mean scores were calculated: Reading Ease, Grade Level, Message Count, Interactivity Ratio, and Message Size.

Results

An analysis of the data revealed a number of statistically significant correlations involving the readability of conferencing messages. Since the correlations used data from 37 courses, there were 35 ($N - 2$) degrees of freedom for all statistical tests. The findings are as follows:

Readability and Messages Written

The number of messages written by students was strongly correlated with their Reading Ease scores ($r = .62$, $p < .01$), and negatively correlated with their Grade Level scores ($r = -.55$, $p < .01$). Accordingly, the results suggest that a relationship exists between the readability of student messages and the number of messages they write. Productivity, at least in terms of message generation, appears to be associated with more readable text.

Readability and Interactivity

The student interactivity ratio correlated positively with both the Reading Ease scores of students' messages (r = .25) and teachers' messages ($r = .38$, $p < .05$), although only the latter was statistically significant. Student interactivity was also negatively correlated at a statistically significant level with both student ($r = -.42$, $p < .05$) and teacher ($r = -.43$, $p < .01$) Grade Level scores. All of these correlations offer evidence of a relationship between readability and interactivity. (Note that low Grade Level scores are an indicator of highly readable text). These findings suggest that levels of interaction are tightly tied to the readability of student and teacher messages.

Higher proportions of learner interaction are associated with a class-wide tendency to produce more readable messages.

Readability and Message Size

The mean message size of student conferencing messages correlates positively with their Grade Level scores ($r = .75$, $p < .01$), and negatively with their Reading Ease scores ($r = -.62$, $p < .01$). Both correlations were strongly significant, suggesting that courses containing longer students messages also contain less readable messages, on average. In contrast, the mean message size of instructor messages was not significantly correlated with readability measures. Thus, while students often use more complex language when writing longer messages, teachers do not share this tendency. The combined results of this analysis and the first analysis (i.e., "Readability and Messages Written") suggest that courses that contain highly readable messages tend to contain a significantly greater number of messages, but messages that are shorter in length.

The Relationship Between the Readability of Teacher and Student Messages

Student and teacher Reading Ease scores were significantly correlated ($r = 0.35$, $p < .01$). The correlation between teacher and student Grade Level scores was also positive ($r = 0.24$), but it was not statistically significant. These results offer some evidence that a relationship exists between the students' style of writing and that of their instructor. That is, if a teacher produces highly readable text, then the students in the class are also likely to produce readable text. Whether this relationship is causal (e.g., the teacher serves as a model of writing practices for students) or due to other factors (e.g., complexity of content) is unclear.

Conclusions

The preceding analyses uncovered a number of relationships between readability and online interaction. Statistically significant relationships were discovered between the readability of student messages and (i) The number of messages students write (positive correlation); (ii) The size of student messages (negative correlation); and (iii) The percentage of messages that reply to other messages (positive correlation). In other words, in courses in which student messages score higher on the two readability metrics, there is greater interaction and more message-writing (although the messages are significantly shorter in length).

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