Online learner analytics of asynchronous discussions as a predictor of final grades

Jeffrey L. Bailie
Purdue University Global

ABSTRACT

For close to three decades. the positive effects of online learner engagement in asynchronous discussions have been reported. Given the many positive effects of asynchronous discussion that have been conveyed in the literature, a preponderance of today's online courses include the activity as a part of the learning experience. It seems only reasonable, however, that the intended learning benefit only occurs when online students fully engage in the discussion activity. This paper presents the results of an inquiry that focused on the involvement of online learners in weekly discussions as determined by the direct viewing of the posts of course participants, and the resulting final grade assigned in the undergraduate course.

Keywords: asynchronous discussion, learning management system analytics

INTRODUCTION

Described by many as "the heart of the virtual classroom;" online asynchronous discussions are designed to promote opportunities for learners to engage with remotely placed classmates and the instructor, encouraging participants to demonstrate their command of the assigned topic, reflect on their own experiences, and share personal insights. According to Ding (2017), potential benefits of asynchronous discussion can include positive outcomes such as promoting thoughtful and reflective interaction among peers, increased engagement of students in online classes, and bolstering active learning. Because positive effects of asynchronous discussion have been reported, a preponderance of today's online courses have been designed to include asynchronous discussions as a part of the learning activities (Cho & Summers, 2012; Palmer et al., 2008). However, it has been suggested that this only occurs when those participating in the online exchange elect to fully engage in the discussion activity, by reading and responding to contributions being made.

An unfortunate misnomer regarding online learning can be that the experience is somehow less demanding than that of a traditional face-to-face (f2f) course. Some might even enroll in an online course having misinterpreted the actual demands for engagement and participation. Although asynchronous online discussions can return positive outcomes, these benefits are only realized if learners choose to participate in the discussion in the first place (Chew & Cheung, 2012). A consistent concern reported in the literature surrounds the question of how meaningful participation by students is measured. While asynchronous online discussions are intended to replicate the classroom discourse evidenced in the traditional face-to-face experience, could the inadequate viewing of the contributions made by members of the online learning group inhibit the desired benefit?

This paper presents the findings of a 2019 investigation of weekly online course discussion analytics in relation to overall online learner performance. The study investigated the relationship between a particular online learner behavior as recorded in a learning management system, and learning performance as measured by final grades. In particular, how does the involvement of online learners in weekly discussions (as determined by the direct viewing of the posts of other participants) correlate to the final grades received in the course?

BACKGROUND & CONTEXT

A common convention in today's online learning classroom includes asynchronous discussion activities that encourage participants to correspond with at least two classmates about an assigned topic, asking follow up questions, referencing other sources to compliment the dialog, and sharing related experiences. By design, the desired response to this activity would be for learners to view multiple responses on the discussion board made by fellow students.

But when a learner opens only a few of the messages posted by fellow participants, they are (in effect) marginalizing the intent of the mutual learning experience. One might speculate that limited viewing of the contributions made by members of the online learning group inhibits the desired benefit of full collegial engagement, which in turn might impede learner performance…. or does it? When a learner constricts participation in the activity to viewing only a few entries made by classmates and the instructor, could it be an impediment on overall performance? Does limited involvement in online course discourse impact overall learner performance?

A major feature of a learning management system (LMS) is the value of data collection and the corresponding option to analyze that data to provide appropriate suggestions and feedback to online students to improve the learning experience (Greller, Ebner, & Schön, 2014). Using LMS analytics, an instructor can better understand how students are accessing the online course content and how assessment scores might be related to individual levels of engagement within the online course (Wolff, Zdrahal, Herrmannova & Knoth, 2013). Zhang (2016) found most studies that sought to investigate discussion board use in the online learning environment have focused on student preference and satisfaction, rather than on the influence of participant behaviors relative to performance. While a review of the current literature results in limited empirical research focused on the online leaner's reading of discussion posts placed by participants, further consideration would seem to be an endeavor of investigative worth.

The problem addressed by this investigation considered whether a correlation could be established between the frequency of an online learner's viewing of the posts made by participants in asynchronous discussions and their resulting final grade in the course. The research question that formed the basis for conducting this study was:

Q1: Is there a correlation between the final grades received by online learners and the number of discussion posts of course participants that they have opened?

LITERATURE REVIEW

The inclusion of asynchronous discussion exercises began to gain popularity as Web-based learning emerged in the 1990's. Asynchronous online discussions allow learners to construct and place messages for other enrolled participants to view and respond to (Hew et al., 2010). Messages, which are commonly referred to as "posts," are visible to those participating in the discussion to read and potentially reply to. Aside from the author of the post, other participants might join in on the exchange. Online learners are expected to engage one another by reading what their classmates (or instructors) have posted and then respond to the topic in a "meaningful" fashion (Putman et al., 2012).

Through such a collaborative exchange, individual students can be reflective, think critically, and are likely to be better positioned to comprehend the concepts than if they were studying the material independently (Hew & Cheung, 2013). Since its inception, asynchronous discussions have been viewed as a practical approach toward engaging remotely placed participants in classroom discourse and investigations conducted over the past decades have identified a wealth of advantages attributed to asynchronous discussion.

By design, asynchronous discussions offer the opportunity for participants to generate collaborative learning though a sharing of knowledge and experience. Online discussions offer the opportunity for students to engage in a mutual learning process proactively thorough interaction with their classmates (Kozan & Richardson, 2014). As such, one might reasonably presume that high interactivity in an online discussion serves to enhance student achievement (Palmeret al., 2008).

Garrison et al., (2000) touted the advantages of asynchronous discussion including the suggestion that because of the delayed nature exchange, discussion entries can be read and reviewed as many times as the individual learner deems necessary, thereby affording more time for personal reflection before forming a response (Garrison et al., 2000). In a 2013 article, Allen, Omori, Burrell, Mabry, and Timmerman concurred with the notion that the timing of asynchronous engagement can make discussion responses more deliberate than that of traditional

face to face engagement. “This means that students can think, edit, research, and post on a topic, even a couple of days after the original post. Unlike the dynamics of a temporal f2f discussion, hesitation or pondering is not penalized” (p. 144).

Studies have also concluded that online discussion can provide opportunities to enhance student learning through direct collaboration among participants (Hew & Cheung, 2013). In a 2009 investigation, Bernard et. al. assembled a meta-analysis intended to compare previous studies with a focus on the types of interactions made between participants in an online class. They categorized the interactions according to three specific types, including: student to content (SC), student to teacher (ST), and student to student (SS). The corresponding evaluation sought to classify differences in the power of connectedness between the three types of participant engagement. The results of Bernard et al. meta-analysis concluded that the SC and SS interactions demonstrate a more significant influence in the online learning endeavor than those limited to ST.

Past studies have also examined the potential connection between online learner participation and the potential influence that it has on learning outcome obtainment. Romero, López, Luna, and Ventura (2013) focused their analysis on the number of messages exchanged between asynchronous discussion participants, including the number of words that were included in those messages, as correlated to the strength of social connection resulting from the engagement. The findings suggest that a correlation between the frequency and length of discussion messages and student performance can be established.

However, low levels of learner participation in online discussion have also been reported to be a concern in the literature (Chan et al., 2009). Low student participation has been defined as students who elect to only marginally participate to the online discussion activity (primarily measured as posts made), as well as those that contribute only enough with the hope that some points might be awarded for their participation.

Past inquires document the importance that active participation in asynchronous discussion activities might also afford in the construction of social knowledge, but such benefits have only been linked to those taking an active part in asynchronous online discussions activities (Hrastinski, 2008). Studies reported in the literature have concluded that, in order to reap the benefits of participation in asynchronous discussions, learners must participate and be motivated to actively engage in the activity to receive the maximum benefit from the experience (Hew et al., 2010). Some investigators have concluded that participation in asynchronous discussion activities should be more broadly defined as to include not only the posting discussion responses, but the viewing behavior as well. For example, Ramos & Yudko (2008) suggested that the number of views are perhaps more predictive of actual learning than are the number of posts that are been made.

Other studies have determined that the “quantity” of participation in no way guarantees the effectiveness of the learning experience, unless participants invest the necessary effort through high-quality participation (Xie & Ke, 2011). Again, suggesting that students must participate in asynchronous online discussions for the experience to be effective, Xie & Ke assigned the absence of quality participation to a lack of motivation on the part of the participant. Ultimately, it appears that learners that do not comprehend the intended benefit of online asynchronous discussions might not fully participate in the activity.

THEORETICAL FRAMEWORK

Garrison, Anderson, and Archer introduced the Community of Inquiry (CoI) model in 1999 as a theoretical framework to evaluate the online learning experience in terms of instructional design and learner engagement. The COI framework identifies three interrelated components, to include: teaching presence, social presence, and cognitive presence (Garrison, Anderson, & Archer, 1999). Over the years, the CoI model has evolved as an instrument that has been applied to afford further understanding of how learning activities and pedagogical design emerge in learning environments such as the virtual world (Mckerlich et al, 2011; Befus, 2016).

The CoI framework positions online learning as an inquiry-based process that demands active engagement between the instructor, learners, and the course content for the most meaningful experience to occur. As one considers these components, interaction is vital through engagement with the instructor (i.e. teaching presence), exchanges with peers (i.e. social presence), or exposure with the instructional material (i.e. cognitive presence). The actual degree to which these components of presence becomes an influence within a CoI is dependent upon participation is restricted, or encouraged (Garrison, et al, 1999).

The focus of this investigation centered mostly on the dynamics of cognitive presence in asynchronous discussions, considering the extent to which an online learner views static posts made by others. More specifically, does an online learner's viewing of online discussion entries of course participants (as determined by the total number of posts opened during the term) correlate with final grades issued in the course?

METHOD

This investigation employed a causal-comparative research design. It involved an analysis of log-file data pertaining to the access patterns of undergraduate online students enrolled in multiple course sections. The subject matter of the courses examined in this investigation represented a bachelor of science degree program in information technology.

Once permission to proceed with the study was received from the Institutional Review Board, course data of 154 unique subjects were collected from the Learning Management System (LMS) licensed to host the online learning program of a single, regionally accredited post-secondary institution having a main campus located in the Great Plains region of North America. The course sections that were included in this effort were the product of random selection, made by the LMS Administrator. The resulting courses included six undergraduate degree level courses that had been delivered online over three 15-week academic terms during the 2018-19 school year.

The data provided for the study was cleansed of any identifying information prior to its release to the investigator, to include numeric values only. The data sets that were released for analysis included the frequency that participants viewed (opened) a discussion post rendered by either a classmate or the instructor (as recorded by the LMS). Additionally, a list of final grades assigned in each class at the completion of the term was also provided. The final grades awarded were used as the measure of learning performance.

RESEARCH DESIGN

The Pearson's Product Moment Correlation (Pearson *r*) was selected to compute the coefficient of correlation for the data sets provided for this investigation. According to Creswell (2005), Pearson *r* is a statistic used to reveal both the direction and the degree of linear

relationship between two variables. The relationship can be either a positive or a negative expression of the correlation between the isolated variables. A customary alpha level of 0.05 was selected to determine the significance in correlation between the independent variable (number of discussion views reported by the LMS) and the dependent variable (the final percentage grades assigned). The desired result was to determine whether a positive relationship between the number of times subjects viewed posts of other asynchronous discussion participants (i.e. X values) and final course percentage scores (i.e. Y values) could be established (Creswell, 2005).

RESULTS

The number of discussion posts viewed by the 154 students enrolled in the courses included in the investigation ranged from 10 to 1113. The final grade percentages ranged from a low of 62 to the high of 100. All of the students that earned a perfect score of 100% viewed the discussion posts within the 95 percentile, or greater. But those receiving the lowest grades (<10 %tile) where not the ones demonstrating the lowest viewership. It should be noted that the actual viewing patterns of learners enrolled in the courses that were reviewed during this study were not considered in this investigation. It is possible, for example, that a student could have viewed the same post multiple times.

As depicted in Table 1 (Appendix), the Pearson *r* value between the number of times subjects viewed posts of other asynchronous discussion participants and final course percentage scores was .1769. Accordingly, the analysis of the data indicated that a correlation of significance at the .05 level did exist when the student viewing of discussion posts was compared to final grades earned in the class sections reviewed for this study. However, it should be noted that this represents only a negligible relationship.

LIMITATIONS

Certain limitations exist with any formal investigation, and it is customary to acknowledge them as the results are presented. The participants included in this investigation were enrolled in a single program of higher learning at an institution located in the United States. Data collected for this study accounted for the viewing patterns of 154 undergraduate students enrolled in six undergraduate degree level courses, that had been delivered online over a span of three 15-week terms. Only the reported LMS analytical data was considered in this investigation.

No demographic factors including gender, age, ethnicity, or enrollment classification or academic standing were considered in the investigation. Factors that might have interfered with the subject's ability to view discussion posts, the extent to which participant's actually read the posts of others, or a participant's decision to mark all discussions as "read" without actually viewing the entries, were also not isolated.

DISCUSSION

When online learning first emerged in the 1980s, those that questioned its validity commonly suggested that online courses lacked the rich discourse that only a face to face engagement might offer. Over the years, the now customary discussion exercise has come something of an anchor to the online learning experience. We all know the cadence: respond thoroughly to the discussion prompt, and then go on to actively engage no less than two of your classmates in meaningful

dialog. Sound familiar? It's the way that we've typically addressed online discussions for more than 30 years.

One approach that has been enlisted in support of online student achievement involves the use of learning analytics. Recent investigative efforts have relied on the review of LMS analytical data to determine levels of participation. Some studies have focused on select demographic data, course access patterns and related performance on assignments as a predictor of final grades (Arnold et al., 2012; Bailie, 2018). In response, researchers have begun to consider more granular features of participants interaction within the online course as a forecast of student achievement. Palmer, Holt, and Bray (2008) isolated two primary variables as predictors of an online undergraduate students' final grade, including the number of initial discussion postings as compared to the prior academic performance of the participants. But the findings suggest that certain interactivity indices, such as the number of messages read, could not be significantly correlated with student achievement. Instead, they concluded that it is possible for some students to engage in deep learning without ever reading the messages posted by others.

The results of this investigation determined that a negligible relationship did exist when the student viewing of asynchronous discussion posts was compared to final grades earned in the class sections reviewed for this study. The findings might offer online practitioners' reason to consider the extent to which their students are fully participating in the asynchronous discussions, especially since the potential benefit of LMS analytics regarding the viewing patterns of enrolled students can be incorporated into a performance review (the extent to which determined at the course, program or institutional level). But the results should also be fodder for further consideration and analysis. Some reflection, in particular, might include:

- To what extent are LMS analytics reports offered in your online courses?
- Based on the reports, how do/would you respond to them (especially when you note information that is far below your expectation)?
- If the viewing of the posts made by others in an online discussion is a measure of participation, should it not be reflected in the assessment of individual learner performance?
- Have you ever discussed the availability of LMS analytics with your students, either individually or as a group?
- Is the use of LMS tracking "pushing the envelope" when it comes to learner performance appraisal? If so, why is it provided to faculty?

Educators have historically faced the responsibility of finding ways to optimally deliver instruction to the learner that they serve. More recently, opportunities to integrate rich technology into their delivery have increasingly come available. The tremendous growth of online learning is a primary example of advancements that has impacted today's approach to instructional delivery, and will no doubt continue to have an effect on how it is delivered in the future. As practitioners in the field of online education, our primary goal is to assist our students as they acquire the skills necessary to succeed in the online environment, which should include guidance on how to benefit from the advantages of participation in an online course. Could it be time to reassess what it is we want to accomplish, or at least the manner in which we evaluate participation in asynchronous discussions?

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APPENDIX

Table 1
Pearson's Product Moment Correlations of the Discussion Views and Final Grades Assigned

	Discussion View (X)	Final Grades (Y)
∑	55806	14132
M	91.766	362.377
SSy	13879.584	20815692.156

Note. Computation of r = 221573.282 / √((726928.679)(2901094.872)) = 0.1526. The P-Value is .028183. The result is significant at p < .05.