Understanding the meaning and value of online metrics: How assessment analytics can be used to support and evaluate collaboration and community in online courses

Abstract

In this panel, five separate papers will be presented exploring the problem of how online metrics can be used to support and evaluate collaborative knowledge building in online courses. Each presenter will focus on one core set of analytics available in a web-based collaborative program called PeppeR: reading activity, writing activity, Liking, login activity and word lists. Within each presentation, the authors will discuss the general purpose of each analytic, the data it represents, and some of the ways these data can be used to guide both instructor and student actions within the online community. The topic of this proposal has general implications for thinking about assessment, in courses ranging from smaller to “massive” in class size.

Purpose

This panel discussion is primarily concerned with the problem of how to effectively use assessment analytics to support and evaluate collaborative learning in online courses. The authors argue that this is both a problem of understanding the nature of the metrics used to generate these analytics, and also understanding how these data can be used instructionally. Each presenter will examine one of the following core set of analytics available within a web-based collaborative program called PeppeR: reading activity, writing activity, Liking, login activity, and word lists.

Perspectives and Theoretic framework

First, building on the original work of Mavrommatis (1997), the authors accept that assessment can generally be described as including five basic phases: planning, evidence collection, interpretation, response, and impact on students and instructors. The authors argue that one of the underlying issues with understanding how to use online analytics to support and evaluate collaborative learning is that evidence collection often remains somewhat disconnected from the other important phases of assessment. For example, data can be collected in the background by the program, irrespective of what the instructor has decided they want to assess (the proverbial ‘cart before the horse’). Furthermore, despite the availability of vast amounts of data, it is not always clear to instructors what these measures actually indicate and how they can be used meaningfully to support instructional responses.
Second, for the purposes of this panel the term assessment is meant to include both formative and summative assessment: specifically of, for and as learning (Volante, 2010). It is generally acknowledged by the presenters that, within online courses there is a need for both ongoing, embedded assessment that can help guide student learning, as well as rigorous evaluation measures that can support student grading. This is particularly important for assessments related to contributions in discussion-centered courses, which have often been criticized for being overly focused on measuring task performance (quantity of posts) rather than efforts to deepen understanding (quality of posts).

Third, it is assumed that the primary objective of assessment is not only to make judgments about student learning, but also to provide information to instructors to help guide their practice. The authors suggest that assessment analytics can provide opportunities for both students and instructors to reflect in action (while the learning experiences are taking place) as well as on action (post hoc).

According to Stahl, Koschmann & Suthers (2006), when the unit of analysis for learning focuses on group interaction rather than individual mental representations, “Collaboration is primarily conceptualized as a process of shared meaning construction” (From mental representations to interactional meaning making, para. 3). Stahl (2006) elaborates on the elements of shared meaning making, which he calls collaborative knowledge building. Collaborative knowledge building includes efforts among group members to: articulate personal understanding to others, discuss alternatives, clarify meaning, negotiate perspectives (towards the development of shared knowledge), formalize & objectify shared knowledge in the form of artifacts, and use shared knowledge in other activities. The authors of the current panel also suggest that, inherent in the idea of collaborative knowledge building - or knowledge building discourse (Scardamalia, Bransford, Kozma, & Quellmalz, 2012; Scardamalia, 2002) - is the notion of sustained involvement on the part of learners. Part of the challenge of sustaining involvement in collaborative knowledge building communities can be met through teacher or student use of analytics. Each of the papers in the session will address a different analytic and show how it contributes in particular ways to thinking about assessment.

Methods

Each paper in the symposium has used a mixed method design incorporating a combination of quantitative measures from automatically generated tracking data, as well as qualitative analyses of discussion content and
interview data. Each presenter will detail their particular data analysis structure and discuss how the assessment analytics available within an experimental online learning environment called PeppeR can be used to support and evaluate collaborative knowledge building, specifically within the context of post-secondary level online courses.

**Data sources**

Data for each of these studies are taken from a large repository of online graduate courses using a locally-developed collaborative online tool called PeppeR - a collaborative online community building environment that contains a public discussion board, a built-in private email system, private chat, a calendar, a resource area, and a suite of integrated analytic tools that provide both formative feedback for teachers and serve as a source of data for hypothesis testing. Automatically generated tracking data from students and teachers using the system provide pictures of online performance and activity. Combining these tracking data profiles with responses from interview data as well as analyses of written discussion entries, gives a comprehensive set of triangulating measures.

**Results and Discussion**

The results and discussion section is framed through the following highlights from the individual paper summaries:

*Paper #1: Valuing Reading and Revisiting.* This investigation used performance analytics and cluster analysis to determine reading and writing patterns in online collaborative discussions taking place in 4 fully online 12-week graduate courses over two years. Assessment of online discussion participation has been reviewed without without specific recommendations for assessment of reading (Dennen, 2008a; 2008b; Solan & Lindardopoulos; 2011; Swan, Shen & Hiltz, 2006). Other related research established the importance and role of online reading for writing (Brett & Wilton, 2013; Wise, Hausknecht & Zhao, 2013) and of rereading for learning in online discussions (Wilton & Brett, 2014). Those whose behavior in online learning discussions produce less written entries than others are sometimes negatively constructed as read-only participants, non-participants, less-visible participants or lurkers (Arnold & Paulus, 2010; Beaudoin, 2002; Nagel, Blignauet & Cronjé, 2009; Nonnecke & Preece, 2001; O’Malley, 1995). Our focus in this panel is on those participants who fall within one of three groups of learners, established through cluster analysis, those demonstrating Efficient
Writing and Broad Reading behaviors. We examine how reading and rereading - often unmeasured and undervalued analytics - may be important indicators of participation and learning.

**Paper #2: Examining instructional uses for writing analytics in online courses.** Arguably, the ability to communicate with others is central to collaborative knowledge building. Although, communication is not limited to writing specifically, Chu, Scardamalia & Bereiter (2012) suggest that a knowledge building orientation can emphasize improving ideas “by exploiting the dialogic potential of writing” (p. 179). For example, in discussion-centered online courses previous research suggests that note revising can encourage more note-linking (linking to others’ ideas) and reading of notes (attention to others’ ideas) (MacKinnon & Hewitt, accepted). In this presentation, the author will briefly discuss three types of assessment analytics for writing (note writing, replies, and note revisions) and how each can potentially be used to support and evaluate aspects of collaborative knowledge building. These analytics are examined in the context of a fully online graduate course in educational technology (offered over a six-week period during the summer semesters in 2012 and 2013) where the instructor emphasized a knowledge building approach to instruction.

**Paper #3: Cultivating a positive social environment to nurture online discussion through the use of a Like button.** This section will examine the role of a Like button, similar to Facebook’s, within the context of online discussions. Examination of the analytics associated with clicking the Like button indicates that it is primarily linked to the socioemotional affordances (Kreijns, et al., 2013) of online discussions in graduate courses across various domains (Makos, et al., 2013). Additionally, preliminary research looking at the quality of student contributions revealed that notes that receive Likes are written at a higher cognitive level than notes that do not receive Likes, indicating that it may act as a way to help students identify more valuable notes in the online discussion (Makos, et al., forthcoming). The presenter will provide examples of both students’ and instructor use of the button in addition to sharing how Liking behaviour is used to understand the socioemotional dynamic (Kreijns, et al., 2013; Çelik, 2013; Clouder, 2006) of online discussions as it relates to assessing the social cohesiveness of a community of learners.

**Paper #4: Understanding the significance of login activity for assessment of online collaborative learning.** This section will aim to nuance our understanding of the nature of student participation by analyzing length of login time and frequency of logins to the learning environment. Knowledge building and collaboration require that
students interact with each other’s thoughts over a sustained period of time; login behaviours can indicate whether students participate actively and often in the environment or whether they enter the environment solely to post responses that fulfill course requirements (Alderman, Vonderwell & Liang, 2007; Rovai, 2007). Additionally, instructors can constrain or structure allotted times for discussions, impacting the nature of student engagement in the environment (Dennen, 2007). This paper considers the behaviours of students in two online courses, as well constraints and requirements developed by instructors and their consequent impact on student engagement and interaction.

Paper #5: Using automated word list analyses as indicators of progress in online collaborative discussions. In this paper we explore different ways that automated discourse analysis can inform instructors about student progress in online collaborative discussions. By examining the prevalence of particular lists of words, and students’ use of these words over time, instructors can extract information about the academic sophistication of students’ online writing, the cohesiveness of their online collaborations, and the affective (emotional) state of the discussion. The presenter will discuss the history of several well-established word lists and review their relevant research literatures. Educational applications will be illustrated using examples drawn from graduate distance education courses.

Conclusions and Educational Importance

Two main themes became apparent after exploring analytics across the five presentations: 1) The importance of examining a range of analytics (rather than isolated measures) to better support and evaluate collaborative knowledge building within online courses, and 2) The need to provide students and instructors with various options to display measures that can be tailored to course objectives and learning goals. Our ongoing research in the project is looking at how analytics that target collaboration and community can be linked more deeply to measures of learning as well as more complex analyses of content.

This panel presentation will be of interest to online instructors, educational researchers in the area of online learning and/or measurement and evaluation, designers of online collaborative software, and post-secondary administrators considering offering online programming within their institutions. Furthermore, although other online software may have different assessment analytics available, the authors argue that there is much to be learned by examining what each has to offer.
References


