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Interactivity in online discussions and learning outcomes

Carmel Kent [a, *], Esther Laslo [b], Sheizaf Rafaeli [a]

[a] Haifa University, 199 Aba Khoushy Ave., Mount Carmel, Haifa, 3498838, Israel
[b] Technion – Israel Institute of Technology, Haifa, 3200002, Israel

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ABSTRACT

The increased use of online discussions in learning environments both formal and informal, positions the construct of interactivity as central to learning. Interactivity in learning communities' online discourse is viewed in this study as a socio-constructivist process. It is the network of interactions among content items and participants which drives a collective knowledge construction process. Conceptualizing interactivity in the literature is still unclear and not enough is known about its role in knowledge construction and about its relationship to learning outcomes. In addition, assessing learning outcomes using analytics has not matured fully and is still subject to intense development. This study thus sets out to investigate the role of interactivity as a process of knowledge construction within online discussions, and in particular, its association with learning outcomes, as measured by formal assessment tasks. We present significant positive correlations between various interactivity measures, taken from various learning communities, and a set of well-known learning assessments. We suggest that patterns of interactivity among learners can be measured, and teach us, not just about group dynamics and collaboration, but also about the actual individual learning process.

1. Introduction

Interactivity is a central design and evaluation construct for online communities. Among the intended outcomes of interactivity in online communities are engagement, sociability, the group's potential to stick together, cooperation, and longevity (Rafaeli & Sudweeks, 1997). Specifically, the focus of this paper is on interactivity in online discussions within learning communities. Social interactions are thought of as scaffolds in the construction of the individual learner's knowledge (Anderson & Dron, 2010). Online discussions are commonly used to complement learning in blended courses, or as the sole or main communication channel among learners and their teachers, in fully online courses, such as MOOCs (Massive Online Open Courses) (Brinton, Christopher, Lam, Chiang, Zhenming, Shalil & Wong, 2014).

Conceptualizing interactivity in online communities has been ambiguous and varied (McMillan, 2006; Stromer-Galley, 2004). Specifically, one line of research views interactivity as situated within the medium (Evans & Sabry, 2003; Sundar, 2004), while Rafaeli (1988) examines interactivity as a process-related variable and thus focused on human to human rather than human to machine interaction. In his definition, interactivity is predicated on the relatedness of sequential posts in a threaded online discussion. Based on this definition, we proposed that interactivity in learning communities is a socio-constructivist process, in which learning results from the interactive exchange of information, while learners develop the

* Corresponding author.
E-mail address: kent.carmel@gmail.com (C. Kent).

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explicit relatedness among posts (Kent & Rafaeli, 2016). To provide empirical validation, we presented a hyperlinked discussion tool, Ligilo (Kent & Rafaeli, 2015), in which each post is expressed as a node in a network of posts, where the semantic relations among posts are generated by the students, who were directed to overtly tag the relationship of their post to the previous one using one of a set or prescribed phrases or clauses to link the two. We also presented a quantitative operationalization framework for interactivity, used within a field experiment. This experiment resulted in significantly higher levels of interactivity in learning communities, when using the semantic networked topology discussion platform over the classical thread based discussion platform (Kent & Rafaeli, 2016). This is evidence that the hyperlinked (structurally constructed) nature of the discussion platform had a significant positive impact on interactivity. In this paper we take the relationship between interactivity and learning one step further, to examine how interactivity correlates with learning outcomes, as assessed in various formats.

CSCL (Computer Supported Collaborative Learning) research views learning through the prism of process vs. outcome (Jeong, 2015). "Interactivity is an iterative process, leading to jointly produced meaning" (Rafaeli & Sudweeks, 1997). "Collaboration is analyzed as a process that gradually can lead to convergence of meaning" (Roschelle, 1999). Thus our main aim is not only to examine the process, but to also learn about its relationship with common assessed outcomes down the road. Specifically, we focus on the learning outcomes each individual gain from interacting within their learning community (Vygotsky, 1978), measured as learner's performance.

Assessment of learning outcomes, as originated from the behaviorist approach, was summative in nature. Behaviorism refers to the outcome or output of the process, and not to the process itself. In that sense, being able to answer correctly an exam question, by rote learning for example, counts for a reasonable outcome of learning. In contrast, formative assessment relates to the process, and is based on the constructivist approach (Duit & Treagust, 1998). In this approach, the process of learning is based on the assimilation of new knowledge by relating it to existing knowledge (Ausubel, 1968). Learners' performance can be assessed summatively or formatively, by factors such as successful completion of a course, exams grades and gain of new knowledge as compared to the beginning of a course. In any case, the assessment depends upon the content of the course, the pedagogic design and the nature of the students (Picciano, 2002). Thus we collected data from various courses, entailing different designs, goals and backgrounds. Eventually, our attempt to learn about the relationship between interactivity and learning outcomes raises the question of whether interactivity in a learning community, for itself, should be seen as a collaborative learning process, as its outcome, or even both.

In the rest of this section, we will briefly review the theoretical relation between interactivity and social constructivism in the context of learning communities' online discussions. We will point to existing literature correlating interactivity in online discussions to learners performance, for example, Balaji and Chakrabarti (2010). In our Method section, we show collected and analyzed quantitative data from multiple learning communities' online discussions. In the Results section we present significant positive correlations between a subset of interactivity measures and various types of summative and formative assessments of learning outcomes (such as multiple choice exams' grades, expert's evaluation of the learners' knowledge and more). Finally, we examine the relationship between interactivity behavioral patterns and outcome assessments of individual learners in various settings of learning communities. We hope to gain initial insights about the association between learners' online interactions and learning outcome assessments in different community and moderation settings.

1.1. Online discussions in learning communities

Online discussions hold a promise for collaborative knowledge construction: participants in online communities are afforded the opportunity to share ideas, learn from peers and build knowledge collectively, while reading and reflecting on each other's thoughts. The virtual settings enable less-assertive participants to compose their thoughts (Hewitt, 2001), while allowing more time for all participants to reflect on and respond to the contributions of others (Poole, 2000). Pedagogically, rationales for learning by online discourse typically make references to the collaborative construction of meaning within online communities (Lander, 2015). It has been suggested that this mode of learning offers opportunities for 'group-centered' rather than 'authority-centered' modes of learning. When learners build on the comments of others, a higher flow of communication and inference is being shown, compared to the "turn-taking" face-to-face environment (Garrison, 2006). In practice, however, quite often online discussions do not meet expectations for engagement (Dennen, 2008; Palmer, Holt, & Bray, 2008); contributions frequently do not respond to or build on one another (Thomas, 2002); and threaded discussions are inherently divergent (Hewitt, 2001), often shallow (Webb, Jones, Barker, & van Schaik, 2004) and disjointed (Zhu, 2006).

This study examines the knowledge construction process of learning communities through interactions among the learners and among their curated content during online discussions. Among a wide range of interactivity conceptualizations, from the field of CMC (Computer Mediated Communication) we follow Rafaeli (1988) who viewed interactivity as a process-related, variable characteristic of communication settings, and conceptualize it as the extent to which posts in a sequence relate to each other. Next, we rationalize the link between this CMC-originated conceptualization of interactivity to theoretical frameworks of human learning.

1.2. Interactivity in online learning communities as a socio-constructivist tool

Online asynchronous discussions provide learners with the opportunity to interact when reading and responding to peers' and teachers' postings. Interaction, as suggested by educational research, is one of the most important tools for learning