A study of the quality of interaction among participants in online animation-based conversations about mathematics teaching

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HIGHLIGHTS

- Reflection and alternativity are two key outcomes of discussion about teaching.
- Evaluation is an important indicator of the quality of discussion about teaching.
- Correlations between the indicator and outcomes exist throughout discussion threads.

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ABSTRACT

We investigate the quality of user interaction in forums that used animated classroom stories to support mathematics teachers' conversations. An analysis of pairs of posts connected by a parent–child relationship helped understand correlations between an indicator (the presence of evaluation markers) and two outcome variables (the presence of reflection on teaching practice and the presence of proposal of alternative teaching actions) related to the conversation quality. This analysis shows that participants who followed up on posts from others were more likely to engage in reflection or consider alternatives if prior posts included evaluation than if prior posts didn't include evaluation.

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1. Introduction

Current approaches to teacher education put an emphasis on learning in, from, and for practice (Lampert, 2010). One way this has been done is through the use of representations of practice, for example, video records of practice and written cases (Grossman et al., 2009; Herbst & Chazan, 2011; Merseth, 1996). These representations of practice have been used to engage novices in noticing aspects of practice and student thinking, and as grounds for talking about knowledge and skills of their profession (Sherin, Jacobs, & Philipp, 2011). As online, asynchronous, discussion forums, or online forums for short, become more common ways of offering teacher education course activities (e.g., in blended or fully online teacher education), it has become important to investigate the affordances of adding representations of practice as reference

objects (Wise, Padmanabhan, & Duffy, 2009) in online forums. While video records of teaching practice have been and continue to be crucial in teacher education, we have been interested in the particular affordances brought to online forums (Chieu, Herbst, & Weiss, 2011; Chieu & Herbst, 2013; Chieu, Kosko, & Herbst, 2015) by representations of classroom practice that are realized with animations created with cartoon characters (Herbst, Chazan, Chen, Chieu, & Weiss, 2011). The use of animations to support conversations about teaching has been useful not only because of technical advantage in online contexts (e.g., low bandwidth requirement, no need to protect the teacher and students' identity), but more importantly to help participants focus their discussion on critical features of classroom interaction (we elaborate more on the usefulness of animations in the following section).

In earlier studies (Chieu, Herbst, & Aaron, 2013; Chieu & Herbst, 2013; Chieu et al., 2015) we defined and operationalized a key indicator and two outcome variables related to the quality of online teacher conversations about instructional practice, and examined the correlations between those variables. Herbst and Chazan

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(2006) identified *alternativity* (i.e., the consideration of alternative teaching actions) and *reflection* (i.e., the discussion of reasons and justifications of teaching actions) as two desirable characteristics of conversations among practitioners that could happen upon discussion of a representation of practice (Nespor, 1987; Schön, 1983; Scott, 2005). Accordingly, we considered that postings in a forum could display *alternativity* (i.e., a posting could include the proposal of alternative teaching actions to those seen in a representation of teaching) and *reflection* (i.e., a posting could contain reflection on actions seen in a representation of teaching or actions proposed by participants), and we considered those as two outcome variables of interest when looking at the quality of postings in a teacher education forum. In asking the question of whether postings contain *alternativity* or *reflection*, we have considered *evaluation* (i.e., whether a posting contained evaluative comments on the teacher or students' actions in an animation) as a possible correlate of those two outcomes.

In an earlier study, Chieu et al. (2015) examined the likelihood that individual posts that included markers of *evaluation* would also contain markers of *reflection* or *alternativity*. We found positive correlations between the indicator (*evaluation*) and the two outcome variables (*reflection* and *alternativity*) in the same forum post by individual participants: The odds for a post to contain reflections or considerations of alternatives were significantly higher when the post included evaluation of a specific action than when it did not include any such evaluation.

Scholars of online forum research have stated that in addition to studying the quality of individual posts, it is also useful to study the quality of interaction among participants (Gunawardena, Lowe, & Anderson, 1997; Jeong, Clark, Sampson, & Menekse, 2011; Kapur, 2011; Stegmann & Fischer, 2011; Suthers & Medina, 2011; see also a more extensive review by De Wever, Schellens, Valcke, & Van Keer, 2006). In particular, various methods (e.g., Jeong et al., 2011; Suthers & Medina, 2011) have been proposed to study interaction between a participant who initiates a post and another participant who replies to the post. A technique that has been used is sequential analysis (Bakeman & Gottman, 1997). Sequential analysis can help determine the probability of a given event being followed by another given event, see for example Jeong's (2005) discussion analysis tool. In the present paper we use a similar technique to examine patterns of meaningful group discussion by looking at whether participants make contributions of interest when they respond to other participants' contributions, distinguishing whether these are of interest or not.

More specifically, this paper extends our previous investigation on individual posts to better understand the quality of threaded forum discussions: How likely is it that forum posts that include *evaluation* will be followed by *reflection* or *alternativity* by other members of the forum? In addition, we look into the role of *reference* (i.e., whether a posting included reference to specific events in an animation that was shared in the forum) as an intermediate variable to support correlations between *evaluation* and *reflection* and between *evaluation* and *alternativity*. We conjecture that the more likely a participant is to use *reference* as resource to support his or her *evaluation* in his or her posting, the more likely the participants who replied to him or her would be to use *reference* in the *reflection* and *alternativity* in their postings. Those correlations, if they exist, might suggest a direction of research on whether and how reference objects (e.g., animated classroom stories in our studies) that are embedded into discussion space can be of use in enhancing the quality of online discussion.

2. Theoretical framework and related work

In this section, we explain why and how *evaluation* can be a possible indicator of social presence, an important construct in online learning (Lowenthal, 2009). We also describe a theoretical framework for the two outcome variables of teachers' conversations (i.e., *reflection* and *alternativity*) and an approach to study correlations between the indicator and the outcome variables in entire discussion threads.

2.1. Social presence and online learning

Scholars in the communications field have developed various conceptions of social presence (Lombard & Ditton, 1997). The first definition of social presence is the "degree of salience of the other person in the interaction and the consequent salience of the interpersonal relationships" (Short, Williams, & Christie, 1976, p. 65). By salience, they mean the quality or state of being there. Other definitions of social presence include "the degree to which a person is perceived as a 'real person' in mediated communication" (Gunawardena & Zittle, 1997, p. 9), "the degree of person-to-person awareness" (Tu, 2000, p. 1662), and "the degree to which participants are able to project themselves affectively within the medium" (Garrison, 1997, p. 6).

Numerous researchers in the field of online learning technologies have adopted or adapted a variety of conceptions of social presence from the field of communications (Aragon, 2003; Lowenthal, 2009; Oztok & Brett, 2011), as Lowenthal (2009) stated: "The theory of social presence is perhaps the most popular construct used to describe and understand how people socially interact in online learning environments" (p. 3). Social presence has been and continues to be a crucial, theoretical construct in online learning (Aragon, 2003; Gunawardena & Zittle, 1997; Lowenthal, 2009). Studies have shown important benefits of social presence, for example, to create a warm, collegial, and welcoming learning environment (Rourke, Anderson, Archer, & Garrison, 1999), and to bring satisfaction and to build trust within a learning environment (Gunawardena & Zittle, 1997).

2.2. Evaluation as an indicator of social presence in online conversations about teaching

For the particular context of online forums about mathematics teaching, we start with a general definition of social presence as learning experiences in which participants live the illusion that a technologically mediated conversation is not technologically mediated (Chieu et al., 2015; Lombard & Ditton, 1997; Oztok & Brett; 2011). To operationalize indicators of social presence, it is important to understand characteristics of conversations in teacher learning. In the context of teacher learning, meetings have often been conducted around representations of teaching practice, in the forms of video records of practice (e.g., Nachlieli & Herbst, 2009; Sherin et al., 2011; Star & Strickland, 2008; van Es & Sherin, 2008; Zhang, Lundeberg, Koehler, & Eberhardt, 2011), animated classroom stories (Herbst & Chazan, 2006; Herbst & Miyakawa, 2008; Herbst, Nachlieli, & Chazan, 2011; Chazan & Herbst, 2012), and so forth (see also Herbst et al., 2011). In those meetings, participants are encouraged to discuss important events of the shared representation of teaching practice and to reflect on teaching actions and decisions in those events. We have started to use animations in the context of online discussions among teachers (Herbst et al., 2011; Chieu et al., 2015; see also Moore-Russo & Viglietti, 2011; Moore-Russo & Wilsey, 2014), and these call for ways of analyzing social presence in the context of communications about teaching practice.

A possible indicator of social presence that we have elaborated in the context described above is the presence of evaluative comments in online conversations about teaching practice (Chieu et al.,