

The Use of Animations and Online Communication Tools to Support Mathematics Teachers in the Practice of Teaching

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Abstract: This paper reports on a pilot study on the effect of animated classroom stories, as a reference point, directly embedded in the space of online communication tools to help mathematics teachers collectively learn to notice critical events of teaching practice. The main results include: more than 70% of the teachers' comments focused on instructional practice, chat and forum could be complementary to help experienced teachers, and only forum could be suitable for novice teachers.

Introduction

The practice of teaching is important but very complex and difficult (Leinhardt & Ohlsson, 1990): the teacher must be able to continuously structure or restructure his or her knowledge in different ways in order to adaptively respond to changing practical demands from moment to moment, adapting different semiotic resources from student to student, and from class to class. We aim at using interactive rich-media representations of teaching and online communication tools for the design of virtual settings to support mathematics teachers in learning to do the practice of teaching. We used animated classroom stories¹ as reference artifacts to prompt discussion among teachers, engaging them in talking about the rationality they invest in action (Herbst & Chazan, 2003). Although animations may reduce some degrees of complexity of classroom interaction, they were designed in such way that eliminated noisy elements (often present in video records of practice) helped teachers attend to important events of classroom interaction. We also embedded the animations as reference points directly into the online discussion space. That original feature can make the discussion among the participants more meaningful and in-depth.

Our first research question is to look at how much of the teachers' discussion is focused on classroom interaction and whether their exchanges are more in-depth when they refer to the embedded animations. The second question is concerned with how the nature of the discussion tool (chat vs. forum) is correlated with teachers' noticing. The third question is to examine the differences in noticing between experienced and novice teachers in those specific settings. Noticing, evaluating, and interpreting noteworthy features of teaching practice are important for teachers to improve their own professional practice (van Es & Sherin, 2008). The study is the first critical step of a design-based research agenda (Collins, 1992) toward building complex virtual settings for teachers to learn to do the practice of teaching.

Method

Nine experienced mathematics teachers were randomly organized into two virtual groups: four in the forum condition and five in the chat condition. A similar pair of sessions was carried out with eight novice mathematics teachers: four in each condition. Those participants had previously seen the animated stories and discussed them either in a study group or in a teacher education class. In both conditions, the participants did the same warm-up activity: viewing a clip from the beginning of a lesson and a clip from the end of the lesson, then responding questions about what might happen in between, and finally viewing the full story. After that the forum participants went to a forum in which three threads with questions about three noteworthy moments were created in advance. The chat participants individually responded to those same questions before joining a chat. A moderator was available in both conditions.

Data included screen records of interaction between the teachers and the online experiences, session logs, and video records of focus groups after the online experiences. Sentences of forum and chat logs were coded to understand what and how teachers noticed during discussion. Our coding system (Chieu, Weiss, & Herbst, 2009) is partly based on the codes used by van Es and Sherin (2008). It consists of five categories: The Topic (what was talked about) codes consisted of five "content topics" (*mathematics*, *students' mathematics*, *teachers' tactics*, *teachers' planning*, and *emotion and climate*), three "context topics" (*media*, *user-interface*, and *interpersonal*), and *other*. The Subject (who was being talked about) codes were *subjectless*, *student*, *teacher*, *self*, and *other*. The Stance (how teaching practice was analyzed) codes were *descriptive*, *evaluative*, *interpretive*, and *other*. The Specificity codes (level of specificity used to discuss teaching practice) were *general* or *specific*. The Temporality codes (how the embedded animation was referred to) were *none or reference to the animation in general* / *scene of the animation* / *action in the animation* / *specific time code*.

¹ Interested readers may request an account at <http://grip.umich.edu/themat/> to watch examples of animations.

Results And Discussion

Overall, the participants in all groups concentrated on discussing their professional practice (more than 70% of their comments were about content). More specifically, they narrowed the focus on making references to students' mathematics, teachers' tactics and planning, and students' emotion and classroom climate. The participants predominantly attended to the animated teacher and/or students. They frequently took evaluative and/or interpretive stances. Except for the pre-service teachers in the chat condition, the teachers' comments were specific, and the specificity was often about pedagogy. The experienced teachers often referred to the animation when they made comments. Those figures were comparable with the results of the video club study (van Es & Sherin, 2008).

We found that relationships existed between referring to the animation and making specific comments. For example, in any group the probability that a sentence that did not refer to the animation in general would be specific was just 60% of the probability that a sentence referring to the animation would be specific (95% CI = [.24, .97], $p = 0.001$). The findings mean that teachers' comments were more specific when they referred to the embedded animation than when they did not. The existence of those relationships shows evidence for the effectiveness of the embedded clips. Indeed, if one assumes that making specific comments engages teachers in more meaningful and in-depth discussions, and helps them notice critical events of instructional practice better (which might influence how well they learn how to do the work of teaching better), then it is useful to stimulate them to refer to the specificities of the shared artifacts when they make comments. Embedding animation clips directly in the virtual space of discussion is an effective way to support this specificity.

The study also found that both chat and forum conditions can be complementarily used to engage in-service teachers in meaningful exchanges about their professional practice. The chat condition, however, may not be useful for pre-service teachers to be able to create in-depth and significant exchanges about teaching practice. The forum condition could be much better for pre-service teachers. Indeed, in that condition they can attend to and discuss instructional practice in a manner that is closer to the way experienced teachers do.

Concluding Remarks

In this paper, we report on a study to understand the nature of the discussion of both teachers in online chat and forum conditions in which animated clips of classroom interaction are embedded and used as a reference point to facilitate and stimulate meaningful and in-depth discussion. We especially look at how the participants notice critical events of the embedded classroom story. The study found evidence to support the *original feature* of our online experiences: *embedding animations directly to the online discussion space*. Although the study did not analyze teachers' actual practice of teaching, it did analyze their ability to notice and interpret critical events of the practice, an important part of their professional work (van Es & Sherin, 2008).

The study, as the first step of a design-based research approach, also identified technological problems and provided suggestions for those problems. For example, because of little experience in the use of forum, several teachers in forum mistakenly responded to a "seed" entry though they wanted to respond to a sub-entry of that "seed" entry. This finding may indicate the need to implement a new forum format in which members' entries will be organized in a semantic and tree-structured system rather than in a chronological system that has been very common in many web-based forums. That feature has been implemented in a new forum tool in the second iteration of our development process. Our preliminary observations with the use of the new forum tool by pre-service teachers suggest that the new forum format seems to sort the above confusing issue out and also help the users follow discussion stories more easily.

References

- Chieu, V.M., Weiss, M., & Herbst, P.G. (2009, April). *A pilot study toward building web-based interactive rich-media virtual settings for teacher preparation and development*. Paper presented at the Annual Meeting of AERA, San Diego, CA.
- Collins, A. (1992). Toward a design science of education. In E. Scanlon & T. O'Shea (Eds.), *New directions in educational technology*. Berlin, Germany: Springer-Verlag.
- Herbst, P., & Chazan, D. (2003). Exploring the practical rationality of mathematics teaching through conversations about videotaped episodes. *For the Learning of Mathematics*, 23(1), 2-14.
- Leinhardt, G., & Ohlsson, S. (1990). Tutorials on the structure of tutoring from teachers. *Journal of Artificial Intelligence in Education*, 2, 21-46.
- van Es, E.A., & Sherin, M.G. (2008). Mathematics teachers' "learning to notice" in the context of a video club. *Teaching and Teacher Education*, 24(2), 244-276.

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