Improving Classroom Dialogue: An Analytics-supported, Video-based Teacher Professional Development Approach

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Abstract: This paper reports on an ongoing investigation of a video-based teacher professional development (TPD) approach enriched by visual learning analytics in teacher education, using a Classroom-Discourse-Analyser platform to help teacher educators engage in evidence-based reflections and online interaction with peers and facilitators. The study aimed to investigate the design, impact and processes of the online TPD approach for changing teacher educators' and student teachers' understanding and practice of classroom dialogue. Positive findings and design implications of analytic-video based TPD are discussed.

Introduction

Substantial evidence has accumulated indicating the role of productive classroom dialogue in student learning (Alexander, 2008; Howe et al., 2019; Wegerif, 2011). In dialogic classrooms, students verbalise, share, build on, ask questions, explain and co-construct knowledge via interacting with teachers and peers. Empirical studies have shown that productive classroom dialogue contributes to subject-matter learning, retention, and even domain transfer effects (e.g., Chapin et al., 2009).

Despite the commonly recognised benefits, developing dialogic teaching continued to pose challenges for teachers---in practice teachers often find it difficult to engage students in effective classroom dialogue involving deep reasoning and argumentation (Resnick et al., 2018). Hence, a research theme is to investigate how teacher professional development (TPD) can be designed to help teachers enhance their knowledge of and skills for facilitating productive dialogue in classrooms (Gröschner et al., 2018).

One emerging approach to TPD is the use of video to support the capturing and teacher reflection of the richness and complexity of classroom dialogues in lesson activities without losing authenticity (Gaudin & Chaliès, 2015; Major & Watson, 2018). While video-recording provides many benefits and new affordances enabling evidence-based reflection, video-based TPD also faces challenge as teachers would not know how to deal with large amounts of data (see Mercer, 2010). Specifically, this is a major challenge in learning sciences research examining how participants dealt with large quantities of data and developing ways to make meaningful use of data to foster student and teacher learning.

The present study

This paper reports on an ongoing study that leverages visual learning analytics technologies to support teacher learning and professional development in an online TPD environment. Our ongoing work has demonstrated the design and development of an analytics-based approach for examining and scaffolding classroom discourse, using the Classroom Discourse Analyser (CDA; Chen et al., 2015, 2018) for visualising and representing classroom discussions. The analytics-supported teacher learning model allows teachers and coach/facilitators to use a visual representation of classroom discourse as a lens to identify meaningful discourse patterns. The CDA's interactive functions transform lengthy video clips and transcripts of classroom talk into graphical displays of discourse patterns. Teachers can identify meaningful segments and click on graphs to view corresponding video clips/transcripts and examine how s/he is developing the classroom talk appropriately or missed opportunities for fostering student thinking. The synchronised and multiple representations of visual analytics and video footage provide multiple resources and evidence for teachers to use in reflection and discussions, enriched in teacher collaboration and inquiry (see Figure 1 for a screenshot of the interface).

The CDA platform can embed different coding schemes and in the present study we employed the Teacher Scheme of Educational Dialogue Analysis developed at the University of Cambridge (T-SEDA, Vrikki et al., 2018). T-SEDA encompasses both teacher and student dialogic moves and recent research using the scheme has shown how productive dialogue predicted achievement (see Howe et al., 2019). Most existing studies on dialogic teaching were conducted in K-12 settings but teacher educators and pre-service teachers both need development in dialogic practice, and there has been little research in this context.

This is an ongoing intervention study in a larger programme of research integrating the development of tools, dialogic practice and TPD. Specifically, the research questions include: (1) What are the changes, in teachers' and students' understanding and use of classroom dialogue? and (2) How does the TPD approach and use of CDA influence teacher educators' understanding and use of dialogic practices?

Methods and data sources

Participants were five teacher educators and their student teachers ($N = 64$) implementing dialogic approach over one semester, using the T-SEDA scheme and teaching. These are multiple sub-classes of students learning educational inquiry (e.g., schooling/curriculum/student learning) so comparison of dialogic approaches and prompts were possible (6-8 classes for each were video-recorded).
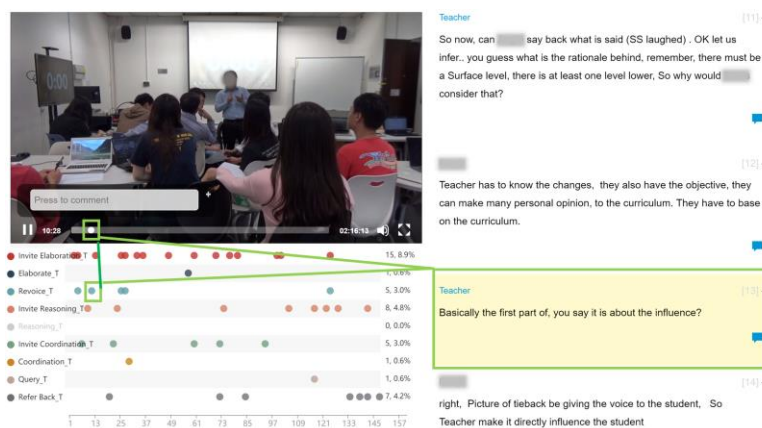
Figure 1. An interface of the CDA with visualisation of temporal sequence and teacher talk moves in a lesson.

At the start, the teacher educators engaged in self-reflection and identified inquiry goals. They participated in five meetings to conduct inquiry into their dialogic practice collectively. They engaged in collective inquiry sharing reflecting on successful and less successful dialogic practice supported by video analytics of teaching events. In the latter phase of project, they participated in analytics-supported video-analyses supported by CDA in both face-to-face and online modes to reflect on their teaching.

Data sources included questionnaires and self-evaluation by teacher educators and preservice teachers regarding their understanding and use of classroom dialogue at the start and at the end of the project, their classroom dialogue, and the conversations in teacher collective inquiry meetings.

Preliminary findings

Quantitative findings indicated higher scores for teachers' self-reflection scores on dialogic strategies (from 4.15 to 5.00) and dialogic culture (from 4.0 to 4.97) (6-point scale) after the TPD intervention. Student questionnaires showed significant changes in dialogic engagement, $t = 2.95$ ($p < .01$), and classroom culture, $t = 5.22$ ($p < .001$), respectively. Qualitative analysis of teacher dialogue using analytic-supported videos suggested dynamics of change: (a) visualisation of classroom dialogue stimulated discussion on meanings of dialogue (e.g., nature of turn-taking) connecting theory and practice; (b) noticing of students' dialogic moves facilitated by CDA navigation connecting teacher and student talk; and (c) rich CDA objects and representations focusing and connecting teachers' different perspectives for productive dialogue. In addition, we also observed changes not only among teacher educators but some evidence of student modelling of teacher dialogic moves (e.g., 'I want to build on what Annie said') corroborated by open-ended questionnaire responses (e.g., 'I elaborated and explained ideas of others').

Significance

The project would contribute to advancing our understanding of the impact of an [online] analytics-supported, video-based TPD approach on teacher professional learning and development in classroom dialogue. Designing analytics-supported video-based dialogue would enrich methodology and provide new directions for analysing and promoting TPD. With continuing development, it has the potential to transform the prevailing face-to-face TPD model into an online TPD model by providing consistent formative feedback that supports teachers' collaborative reflections and online interaction with peers and facilitators.

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