Teacher Learning at the Boundaries of Cross-Curricular Collaboration

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Abstract: The value of interdisciplinary learning for teachers is rarely explored in the literature on professional development. This study examines the learning potential of collaborative curricular design by an English teacher and a science teacher. A qualitative case study approach is used to examine the learning opportunities that arise from teachers' attempts to establish continuity at the boundaries of cross-curricular collaboration. The mechanisms that give rise to learning opportunities are analyzed using a boundary crossing framework.

Introduction

To equip students with the necessary skills and knowledge to thrive in an increasingly complex and globalized world, it is recommended that school curricula should include interdisciplinary approaches to learning (OECD, 2019). However, academic and administrative boundaries between disciplines are perceived as barriers that discourage interdisciplinary collaboration among teachers (Donahue, 2003). Instead of acting as obstacles, these boundaries can provide rich opportunities for learning (Wenger, 2000).

This research study seeks to examine the learning potential at the boundaries encountered by teachers during cross-curricular collaboration. In a researcher-initiated intervention, an English and a science teacher from the same secondary school collaborate to design teaching resources for an interdisciplinary topic. During the process, they will have to negotiate and/or cross several boundaries arising from differences in the teachers' knowledge, beliefs and practices. These boundaries are defined as "socio-cultural differences that give rise to discontinuities in action or interaction" (Akkerman & Bakker, 2011, p. 139).

Understanding learning as sense-making at the boundaries enables the adoption of a framework from boundary crossing literature. The framework classifies learning processes into four mechanisms: identification, coordination, reflection and transformation. Briefly, identification recognizes differences between practices, coordination refers to objects or activities that facilitate boundary crossing, reflection forms new perspectives based on differences, and transformation creates new practices from current ones. These mechanisms will be used to analyze the process of teacher learning from a dialogical perspective, illustrating the crucial links between boundary encounters and learning opportunities.

Methods

The two teachers and the researcher (author of this paper) formed a teacher design team (TDT), a type of professional learning circle specifically focused on the (re)design of curriculum (Handelzalts, 2009). The interdisciplinary TDT will develop a unit plan with accompanying teaching resources on the critical reading of science news. The TDT in this school is the ongoing pilot of a qualitative, multi-case study (Yin, 2014) in which the researcher will carry out the same intervention in three other secondary schools. The monthly TDT meetings began in September 2019 and are all facilitated by the researcher. The TDT conversations are audio-recorded and teachers are required to fill in a reflection log template after every meeting.

The data collected from the TDT conversations and reflection logs are coded. Two coding schemes are adopted for this purpose – interaction function (IF) codes adapted from Dudley (2013) and learning mechanisms (LM) codes derived from Akkerman and Bakker (2011). The LM codes are applied to the teacher reflection logs, and both IF and LM codes are used on the transcripts of TDT conversations. For discourse analysis, the IF codes are applied to every utterance in each transcript. Selected IF codes taken as indicators of potential boundary encounters (e.g., disagreeing with or challenging the point of the other teacher) will be further examined for evidence of learning mechanisms using the LM coding scheme. Findings from discourse analysis are triangulated with those from teachers' reflections to surface learning opportunities.

Findings

The boundary encounters during cross-curricular collaboration are presented as learning episodes. Each learning episode comprises an analysis of the boundary encounter from the perspectives of the boundary, the learning mechanisms involved and learning opportunities that arise. The following episode occurred during the first TDT meeting.

Boundary: When discussing the use of science news in their classrooms, the science teacher, Sue, expressed her preference for teaching students the science facts before referring them to real-world contexts in

science news (science-first approach). The English teacher, Paul, indirectly challenged her by saying that he found it a "problem" that science education tends to lack context (coded as IF-CHAL). Although not a science teacher, he nonetheless had an opinion that science should be taught by first exposing students to real-world problems to encourage learning through inquiry (context-first approach). The boundary here is not caused by epistemiological differences between science and English but by contrasting teaching approaches for the same subject.

Learning mechanism: In response to this boundary, both teachers used *identification* in the discourse. In a process called legitimizing co-existence (IDEN-LC), where the value of each differing practice is recognized, Sue justified (IF-JUS) the validity of her approach by saying: "So my approach and his approach is like the opposite way, but there's no right or wrong, it's just how much time we are given during curriculum to do all these things". While developing (IF-DEV) this point by Sue, Paul also continued to legitimize co-existence by saying that the classes that take more science subjects may be more open to Sue's science-first approach, while the classes that take literature may prefer his approach.

Continued discussion on these two approaches led Sue to form a new perspective through the *reflection* mechanism. In her reflection log, Sue wrote: "To a certain extent, I actually like to try out his (Paul's) way to see if the kids are more engaged". This is an example of perspective-taking (REF-PT), where one's new perspective takes another's perspective into account. The point about increasing student engagement came from Paul. He had used a mixture of hypothesizing (IF-HYP) and rehearsal (IF-REH) functions in his talk to describe how his approach could be fun and engaging. These interaction functions likely strengthened his point about engagement to the extent that Sue was willing to test his claims in her own practice.

Learning opportunity: Although it is uncertain as to whether Sue will experiment with the context-first approach in her classroom practice, the identification and reflection mechanisms revealed an opportunity for her to gain new insights about pedagogical content knowledge (PCK) in science education. As the PCK lies outside his subject domain, this episode held limited learning potential for Paul. He only went through identification, and there was no evidence that he formed new perspectives through this boundary encounter.

Discussion and next steps

By focusing on boundary encounters, this study demonstrates the complementarity of interaction analysis and learning mechanisms in providing a structured and in-depth analysis of teacher learning opportunities. Interaction functions facilitate the application of the boundary crossing framework to discourse, while the framework can in turn elucidate the links between discourse features and potential changes in cognition.

It is evident that the identification and reflection mechanisms can effect changes in the knowledge and beliefs of the teachers. The other two mechanisms, coordination and transformation, are not highlighted in the featured learning episode. These mechanisms involve decision-making geared towards practice, and therefore may surface only during later stages of the planning process. Generally, it is not expected that there will be much evidence of the coordination mechanism initiated by the teachers during the study, as the bulk of the coordination that facilitates boundary crossing is planned and carried out by the researcher.

After the additional case studies are completed, cross-case analysis will be carried out to identify common patterns or features across learning episodes. These could pertain to activities that create boundary encounters, or discourse features that promote learning opportunities. Such findings not only highlight the learning potential of cross-curricular collaboration, but also contribute to the design of professional development activities for teachers.

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