

CONDUCTING PD DISCUSSIONS ON LANGUAGE REPERTOIRES: A CASE STUDY ON FACILITATORS' PRACTICES

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Professional development (PD) programs need to qualify teachers to promote language learners by building upon and successively extending their language repertoires. Although PD facilitators play a crucial role in these PD programs, their facilitation practices have not yet been empirically captured very successfully. This case study investigates the facilitation practices of two facilitators in a PD on language-responsive mathematics teaching. The qualitative analysis identifies the goals and knowledge aspects that guide their practices. It shows that detailed pedagogical content knowledge on the classroom level (PCK-C) and PD level (PCK-PD) supports goal-oriented facilitation, in which PCK-PD is required to relate the teachers' ideas about first languages to the teaching approach of building upon languages repertoires. This study contributes to extending existing generic frameworks for facilitation practices to specific PD contents, in this case to language-responsive mathematics teaching.

Establishing new teaching approaches requires PD programs; this is also the case for language-responsive mathematics teaching approaches such as building upon students' language repertoires (Barwell, 2018; Planas, 2018). So far, PD programs on language-responsive teaching have mainly been studied with respect to their PD content and PD materials (Hajer & Norèn, 2017) and the teachers' learning processes (Prediger, *subm.*). Although the PD facilitators' practices are crucial for the success of the PD, research has not yet focused on them. In order to reduce this research gap, this research report presents a case study of two facilitators' practices conducting PD discussions on using students' language repertoires. For this, we adopt existing research frameworks on facilitation practices (developed for other PD contents) such that we can use them for identifying the underlying goals and knowledge resources (Borko et al., 2014; Tekkumru-Kisa & Stein, 2017) and pursue the following research question: By which practices do PD facilitators lead discussions on students' language repertoires, and by which goals and knowledge aspects are these practices guided?

THEORETICAL AND EMPIRICAL BACKGROUNDS

Background on the classroom level: Building upon language repertoires

Effective teaching approaches build upon students' individual resources and systematically connect new content to students' prior knowledge. For multilingual students, this general principle translates into the call to include students' first languages and all informal, multimodal resources that can support their processes of meaning construc-

tion for new academic and technical language in math classrooms, i.e., students' language repertoires (Barwell, 2018; Planas, 2018). Figure 1 (Prediger, Clarkson, & Bose, 2016) depicts the components of these language repertoires and the need to repeatedly relate them. In order to unfold the principle in mathematics classrooms, teachers should learn the following content aspects of teachers' language-related pedagogical content knowledge (PCK-C on classroom level) in the PD program:

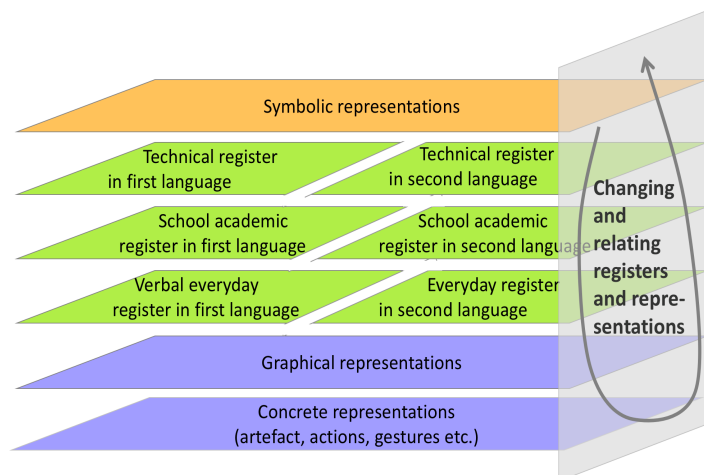


Figure 1: Relating registers and representations for building upon language repertoires

- PCK-C1 Overcome *language policy concerns* against underprivileged first languages (Barwell, 2018; Planas, 2018)
- PCK-C2 Challenge kids to produce output in all registers (*offensive approach* rather than reducing academic language demands; Prediger, *subm.*)
- PCK-C3 Become aware of the *epistemic function* of registers and representations (rather than only a communicative function; Prediger et al., 2016)
- PCK-C4 Support not only the change, but the systematic *connection* between registers and representations (Prediger et al., 2016)
- PCK-C5 *Successively develop* students' language repertoires by extending the existing resources and connecting them (Planas, 2018)

Background on PD level: Goals and knowledge underlying facilitation practices

In the last decades, PD facilitators' practices (in PDs with other mathematical PD content) have been investigated with two different foci: the enacted facilitation moves and the underlying or necessary knowledge that facilitators should refer to. Some *facilitation moves* have been classified independently from the PD content (van Es et al., 2014): lifting up (identifying an important idea that a participant raised in the discussion for further discussion), countering (offering an alternative point of view), connecting ideas (making connections between ideas raised in the discussion), and standing back (allowing the group members time discuss an issue). In order to understand facilitation practices, the facilitation moves should be considered together with the underlying goals (already partly realized in the framework of van Es et al., 2014) and the knowledge aspects to which the facilitators implicitly or explicitly refer (in this perspective, we lift a research framework from the teacher PD level to the facilitator level, see Prediger, *subm.*).

For the *goals*, we adopt Schoenfeld's (2010) conceptualization and distinguish *content* goals (when facilitators pursue selected PD content learning goals) from *process* goals (when facilitators strive for PD process qualities as active engagement of participants).

For the *knowledge*, we start from Borko et al. (2014), who show that facilitators' practices rely on the knowledge aspects the facilitators implicitly or explicitly refer to. The authors conceptualize relevant knowledge aspects (in what they call mathematical knowledge for professional development), comprising specialized content knowledge on "mathematical content and relationships" and pedagogical content knowledge including "the ability to engage teachers in the interpretation of students' mathematical ideas and the purposeful analysis of instructional practices" (p. 165). Hence, they relate content knowledge to the classroom level (here abbreviated by CK-C) and pedagogical content knowledge to the PD level (PCK-PD). To complete the components on both levels, we add CK-PD and PCK-C: CK-PD refers to the facilitators' knowledge about the teaching approaches and content in view, containing CK-C, and PCK-C refers to the teachers' existing and intended pedagogical content knowledge on the classroom level. We follow Borko et al.'s (2014) call to empirically disentangle the knowledge aspects that are most relevant in the facilitators' practices.

METHODOLOGICAL FRAMEWORK

Methods for data gathering

The presented case study is embedded in a large PD research project on PD courses on language-responsive math teaching (Prediger, *subm.*). The video-recorded PD courses usually take four hours and are conducted by two facilitators each. To capture the facilitators' goals and the knowledge aspects they refer to, each PD session is triangulated using a video-based debriefing session in which both facilitators discuss with a researcher the critical incidents in the PD session (chosen by all three).

The data selected for the case study in this research report stems from Alice and Christin's first PD session on language-responsive math teaching with 16 unknown teachers, followed by a debriefing session with the facilitators. At the time of the study, Alice had 10 years of experience as a teacher and some experience as a facilitator and PD material developer (in other topics), while Christin had little experience as a teacher at school and as a facilitator but much as a researcher on language.

Methods for qualitative data analysis

The qualitative data analysis followed deductive category-led analytic procedures (Mayring, 2015) in four steps: (1) Relevant sequences of discussing language repertoires were identified and transcribed; (2) the enacted facilitation moves were classified according to the framework of van Es et al. (2014); (3) the goals and knowledge aspects that were likely underlying were interpreted and classified as process/content goals as either PCK-PD, CK-PD, PCK-C, or CK-C (see above for the definition of categories); and (4) the interpretations were triangulated with the facilitators' reflections and their further perspectives in the debriefing sessions.

CASE STUDY: THE FIRST PD SESSION OF ALICE AND CHRISTIN

Alice's provocative move for the process goal of engaging teachers in discussions

The selected episode (occurred after a 2.5-hour of the PD session), emerged in a sequence dedicated to introducing the teaching approach of relating registers and representations (visualized by a slide with Figure 1). Both facilitators felt a bit uncomfortable as they considered themselves as not sufficiently successful in engaging the teachers in vivid discussions. In this situation, Alice decides to deviate from the original PD schedule by addressing the additional topic of allowing students' first languages in (usually monolingual) mathematics classrooms which was planned for later in the PD.

S1	Al.	It is suggested [<i>by the research</i>] that if two students have the same first language, for example Turkish, and sit side by side in the classroom, that they first have the opportunity to clarify certain things related to the task in Turkish.... So that the language isn't an obstacle.... We ourselves, we actually have the rule always to talk in German in class. But it [<i>allowing the use of the first languages</i>] seemed for me, somehow. I have tried it then. In the moment it was a success for me, because they could suddenly talk about things about which they couldn't talk about well in German. Have you had any experience with this?
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She underpins her argument by referring to research and to own experiences in school (Turn S1: "I have tried it ... it was a success for me"). Her question leads to a vivid discussion in which all contributing teachers disagree for various reasons:

S2 Te1 I'm just wondering if that isn't a contradiction to, that you have to challenge the students. I'm not sure.

... ..

S4 Te2 Well, in our case, it is like that: Since they have already reached the eighth grade at the Gymnasium [*track for higher achieving half of students*], then they should be able to talk about an everyday problem. If they should not even use technical terms, then they should do it in German. Thus I don't like it if they communicate about the problem in Turkish....

S5 Te3 Exactly.

S6 Te2 In working on a task you can ask again.... I had the word "tachometer," which some didn't know.... for example... And for this [*answering the vocabulary question*], there are classmates and I'm still there [*to answer*], too.

The teachers' contributions reveal different pedagogical content knowledge aspects (from the list in the first section): Teacher Te1 (Turn S2) refers to PCK-C2, as she considers the use of first languages in mathematics classrooms as a contradiction to an offensive approach of pushing language demands. Teacher Te2's utterance (Turn S4: "They have already reached the eighth grade ... They should be able...") and the confirmation of Te3 (Turn S5) show that they share language policy concerns against underprivileged first languages (PCK-C1) but miss the epistemic function of the first language by focusing only on a deficit-compensating communicative function (PCK-C3).

The second contribution of Te3 (Turn S6) again focuses only on the communicative function of registers and representations (limiting PCK-C3).

During the discussion Alice does not comment the teachers' contributions in a content-related way, thus she does not refer to the content aspects (but her co-facilitator does; see below). At the end of the discussion she closes with the following utterance:

S16 Al. ...I put it [*topic of allowing first languages in mathematics classrooms*] here consciously on the table to discuss it controversially. You have done that well. Just to make suggestions about what is possible. Of course, you always have to weigh them for yourself: what makes sense and what does not make sense for you.

Alice knows that the idea of including first languages might raise teachers' objections. However, she addresses the topic of PCK-C1 (overcoming language policy concerns against underprivileged first languages, in the list of the first section), which usually comes later in the PD program. In Turn S16, she makes explicit that she has used the topic to bring up a provocative issue (a variant of countering in the category system of van Es et al., 2014). By this, she seems to pursue not a PD content goal, but the process goal of engaging teachers in a more vivid discussion. This interpretation is confirmed by her explanation and evaluation of her decision in the debriefing session:

D7 Res. What did you [*to Alice*] think in this moment? Which criterion did you use to decide, if it was right or wrong?

D8 Al. For me, the group seems so lifeless and I can't manage this though, because I feel that we overfeed them with content and they say afterwards: "It was nice, but I didn't get anything out of it." Then it was like that, that I thought, perhaps, ...they have another orientation to this topic and I thought...it is provocative in this situation. And perhaps, I knew, that it could be difficult and that they face this negatively. But I was very aware of this and hoped that they get some way to see a new perspective for the thing.

D9 Al. And...when they discussed, I thought it was right to make this....

To pursue her process goal of engaging teachers in a more vivid discussion, Alice draws upon her PCK-PD (Turn D8: "perhaps...they have another orientation to this topic and I thought...it is provocative in this situation.") that many teachers share language policy concerns against underprivileged first languages (PCK-C1). Her focus on a process goal could probably also explain why she does not intervene in the discussion and closes it (in Turn S12) without commenting on the PD content itself. Her goal is reached, as several teachers have contributed to the discussion (Turn S12: "You have done that well"; Turn D9: "when they discussed, I thought it was right to make this."). This focus on the process goal explains why Alice activated only very limited parts of her own CK-PD, reducing the use of first languages to its communicative function of compensating for deficits in the second language (in Turn S1 and by not reacting to Turn S4), without addressing PCK-C2 through PCK-C5.

Christin turns the process goal into a PD content goal

After the teacher's contribution in Turn S6 (see above), Christin tries to fuel the discussion by some framing using the theoretical construct of zone of proximal development, which refers to the idea of successively building and extending student language repertoire (PCK-C5):

S7 Chr. That is perhaps also a bit the question about what is the zone of proximal development of the students. Thus, if the language problem is perhaps so big that the given requirements are too big for the students to reach, it is perhaps helpful if they initially speak in Turkish. If it isn't possible otherwise. But probably most of the students – I don't know how it is with your students – for them it is probably in their zone of proximal development.

Christin's enacted facilitation move can be classified as an instance of connecting ideas (van Es et al., 2014), as she tries to make connections between Alice's and the teacher's contributions and the PD content on a productive use of students' language repertoires. She introduces the construct of zone of proximal development relating to the longer-term development of language (PCK-C5), which serves here as a mediating construct to explain why some teachers believe the first language not to be necessary (because the zone has already been left behind) and Alice's experience of girl who used it productively. Mediating constructs are a key issue in PCK-PD. By these moves, she turns Alice's process into a content goal: Her facilitation goal is not only to have a vivid discussion, but she starts to work towards the PD content goals of teachers' PCK-C2 and PCK-C5. During the debriefing session, Christin explains why she made the comment:

D10 Chr. That was because I sat there and realized that you talked about different things. That they didn't understand what you meant. Instead, they perceived it as a contradiction too: We make it offensive [*i.e.*, *we call for language learning opportunities*] and confront them with the requirements [*rather than allowing them to escape into their home language*].

... ..

D11 Chr. In this situation I thought that I would try to make it explicit.

According to her debriefing reflections, Christin felt she made the comment because she noticed the participants' irritation with a felt contradiction between Alice's contribution (allowing the use of first languages in mathematics classrooms) and the offensive approach of language-responsive mathematics teaching (PCK-C2). Hence, she noticed the core of PCK-C2 in the utterance of Teacher Te1 (in Turn S2).

As Alice quickly closes the discussion about the unplanned topic, both facilitators could not yet exploit the emerging learning opportunities for PCK-C2 and PCK-C5. In the debriefing session, both facilitators reflect further on how to overcome teachers' concerns in order to also reach PCK-C2 and PCK-C5 for first languages.

The most critical issue seems to be that none of the teachers (nor the facilitators) address the epistemic function of first languages: First languages are not important for compensating communicative restrictions (especially not for native resident multilin-

goals) but contain valuable extended thinking tools relevant for the meaning-making process, even for students with good language proficiency in the language of instruction (PCK-C3). This epistemic potential for meaning-making unfolds not by switching between the languages, but by systematically connecting them in different registers and representations (PCK-C4). Connecting the teachers' ideas to these knowledge aspects would have required PCK-PD on further mediating constructs.

However, to understand Alice' decisions about her facilitation practice, the process goal in its own rationality must be taken into account. Due to time restrictions of PD sessions, nobody can exploit every learning opportunity that spontaneously emerges.

CONCLUSION AND OUTLOOK

What can we learn from the case study with its limitations in sample size, scope, and topic? With respect to the specific PD content of activating students' multilingual language repertoires (Planas, 2018; Prediger et al., 2016), we realize that not every hint to including first languages as a part of students' language repertoires is automatically productive for reaching the PD content goals. In particular, the analyzed discussion seemed to be hindered by reducing first languages to the communicative function for those who cannot sufficiently speak the second language. Barwell (2018) and Planas (2018) have pleaded for emphasizing the epistemic role for the meaning constructions and an extension from the first language or languages to other registers and representations. Christin's moves are first steps in this direction, but perhaps not yet sufficient for exploring the epistemic function of all registers with the participating teachers. In further work with these facilitators and in preparation of new facilitators, CK-PD should be strengthened to flexibly relate to all five aspects of PCK-C1 to PCK-C5.

On a more general level, the case study modestly contributes to successively developing a research framework for understanding facilitation practices in an empirically grounded way: Rather than only identifying the pedagogical tools such as facilitation moves (e.g. connecting ideas), understanding the facilitators' practices requires the interpretation of the goals and the knowledge aspects the facilitators explicitly or implicitly refer to or do not refer to in a certain PD situation. Methodologically, the video-recorded reflections from the debriefing sessions are essential for triangulating the interpretations of goals and knowledge resources. For these goals, we replicated Tekumru-Kisa and Stein's (2017) and Borko et al.'s (2014) observations that pursuing the PD content goals is a demanding job for the facilitators. The distinction between PCK-C and PCK-PD allowed us to unpack not only the different PCK-C aspects to which Alice and Christin refer, but also to disentangle different ways in which PCK-PD can relate to these PCK-C aspects:

- Working with knowledge about typical obstacles in teacher learning for provoking discussion (Alice consciously brings up PCK-C1 for provoking objections),
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- Noticing an occurring obstacle in teachers' learning pathways and supporting them to overcome the obstacle (Christin notices teachers' irritation at an apparent contradiction with PCK-C2 and tries to harmonize them),
- Pursuing PD content learning goals (Christin redirects the focus to PCK-C2 and the apparent contradictions), and
- Connecting two PD content learning goals (Christin introduces the construct of zone of proximal development to connect PCK-C5, but not yet PCK-C3 and -C4).

These distinctions should be followed up in future research in order to elaborate the conceptual frameworks for understanding PD facilitation practices. This is highly relevant as Borko et al. (2014) describe the specific importance of the flexibility and connectedness of facilitators' knowledge base for goal-oriented facilitation.

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