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articoli

Teacher learning and student outcomes in the context of classroom discourse. Findings from a video-based teacher professional development programme

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Abstract

Presentiamo un programma innovativo per lo sviluppo professionale degli insegnanti (TPD), centrato sulla ridefinizione della conduzione di interazioni verbali in classe. Sono riportati i risultati dell'apprendimento di insegnanti e studenti, e la riflessione sulle implicazioni pratiche per la ricerca futura sul programma. Nel "Dialogic Video Cycle" (DVC) sei insegnanti hanno partecipato per un anno a un intervento di TPD mediante videoregistrazioni usate come strumenti di riflessione sulle proprie pratiche e per le discussioni di gruppo. Abbiamo confrontato il DVC con un programma TPD tradizionale (*n*= 4 insegnanti). Inoltre sono stati valutati gli orientamenti degli studenti (*N*= 226) in termini di motivazione e fiducia nelle proprie capacità. I risultati mostrano che le componenti efficaci del TPD potrebbero essere attuate con successo nel DVC e che questo programma migliora le prestazioni degli insegnanti nella conduzione del discorso in aula e stimola negli studenti l'interesse per l'argomento, il senso di auto-efficacia e il concetto di sé. Il DVC sembra uno strumento promettente per favorire l'apprendimento degli insegnanti con un impatto sulla motivazione e sull'apprendimento degli studenti.

Parole chiave: video; formazione di insegnanti; motivazione; concetto di Sé.

Abstract

We present an innovative teacher professional development programme (TPD) focusing on the re-definition of teachers' discourse behaviour. We report findings on teacher learning and student outcomes, and reflect on practical implications and directions for future research on the programme. In the "Dialogic Video Cycle" (DVC) six teachers participated in a year-long intervention built on effective components of TPD and using videos of teachers' own practices as tools for reflection and basis for group discussions. We compared the DVC with a traditional TPD programme (*n*= 4 teachers). Additionally, students (*N*= 226) were assessed regarding their motivational orientations and individual beliefs. Results show that effective TPD components could successfully be implemented in the DVC and that this new and innovative programme enhances teachers' performance in classroom discourse and affects students' interest in the subject, self-efficacy and domain-specific self-concept of ability positively. Thus, the DVC seems a promising tool to foster teacher learning with an impact on perceived student motivation and learning.

Keywords: video; teacher learning; teacher professional development; motivation; self-concept.

1. Introduction

Verbal interactions between teachers and students represent a dominant context for teaching and learning in STEM subjects. Typical for practices of classroom discourse is a narrowly-focused questioning-developing teaching style, in which the teacher has a dominant role in steering the interaction (Seidel & Prenzel, 2006). However, if teachers are successful in actively engaging their students in classroom discourse, they are likely to engage them in more meaningful and sustained learning experiences (Michaels, O'Connor & Resnick, 2008; Walshaw & Anthony, 2008). It is therefore important to change students' experiences in the classroom in order to facilitate them with meaningful learning experiences by changing the prominent routines of classroom discourse.

Currently, teacher professional development (TPD) programmes are developed to promote teachers' skills in productive classroom discourse and to help teachers re-define their instructional routines (Mercer & Dawes, 2014). In order to improve classroom discourse, video examples of teacher-student interactions have evolved as a promising tool for supporting teachers' reflection on classroom practices and systematically analysing interaction patterns (Tripp & Rich, 2012). Yet, more research is needed in order to thoroughly investigate the effectiveness of TPD programmes, their scope in promoting student learning outcomes, as well as the incremental value of video as a tool for reflection.

The project presented here, is focused on a new and innovative video-based TPD programme, the Dialogic Video Cycle (Gröschner, Seidel, Kiemer & Pehmer, 2014), fostering teachers' skills to provide their students with *productive* classroom discourse. Productive, in this context means, that teachers verbally engage students in classroom discourse (e.g. by activating students' pre-knowledge through open questions) as well as scaffold student learning by giving concrete and learning-oriented feedback. The DVC is implemented as an intervention and is compared to traditional TPD workshops in the German context (Richter, Kunter, Klusmann, Lüdtke & Baumert, 2011). The project focuses on the question, to what extent the intervention (Gröschner, Seidel, Kiemer, & Pehmer, 2014) positively affects teachers' practices, as well as students' motivational learning outcomes. The comparison of the DVC with a traditional programme aims at shedding light on the benefits of video-based TPD in comparison to more common practices of professional development, as well as on the importance of productive classroom discourse for student learning. In this paper, we present central findings from the study with regard to the implementation of the DVC, teacher changes during the participation in the DVC and changed student interest, self-efficacy and domain-specific self-concept of ability. In the end we reflect upon the development of the DVC and conclude with steps for future research.

2. Theoretical Background

Productive Classroom Discourse

Research on classroom discourse shows that the use of language and the quality of interactions have important implications for students' learning processes and learning outcomes (Lipowsky, Rakoczy, Pauli, Reusser & Klieme, 2007; Michaels et al., 2008), their active engagement (Pauli, Drollinger-Vetter, Hugener & Lipowsky, 2008), as well as their learning motivation and interest (Seidel, Rimmele & Prenzel, 2003).

Walshaw and Anthony (2008) differentiate two major teaching strategies which characterise productive classroom discourse. The first activity refers to "clarifying discourse and participation rights and responsibilities" between teacher and the students. The objective is to activate and engage all students in classroom conversation. The second activity is focused on "scaffolding students' ideas", e.g. by giving constructive feedback in order to move student thinking forward. The two activities can be conceptualised through meaningful forms of teacher questions and feedback (Jurik, Gröschner & Seidel, 2014). Yet, in order to facilitate learning, teachers must also learn when to provide their students with assistance, as it can serve both, as a "withholding" or a "giving" process of support (Koedinger & Aleven, 2007).

Effective Teacher Professional Development (TPD)

With regard to the successful conceptualization and implementation of TPD programmes, educational research has pointed out a number of effective components for teacher learning (Desimone, 2009). The core features referred to in the literature are: *content focus* (focuses particularly on subject content, but also on pedagogical content, and student learning processes of a specific subject), *active learning* (should include learning opportunities that allow transfer of experiences as necessary condition), *collective participation* (concerns collaborations between teachers to set up potential interaction and discourse), *duration* (includes span of time over which the TPD activity is spread as well as the number of hours spent in the activity) and *coherence* (should be consistent with teachers' knowledge and beliefs or at least provide examples to ongoing innovations or specific problems that teachers experience in their daily work).

In order to provide more intensive support for the learning process of teachers, recent TPD programmes include video-based reflections of teachers' own teaching practices (Sherin & van Es, 2009; Tripp & Rich, 2012). By using video as a tool in TPD, teachers are encouraged to see their teaching from a new perspective, and to feel accountable for changing those (Tripp & Rich, 2012).

The Dialogic Video Cycle (DVC)

In this intervention, teachers participated in two iterations of the newly developed, video-based and reflection-oriented TPD programme of the DVC (Gröschner, Seidel, Kiemer, & Pehmer, 2014). The DVC concentrates on generic aspects of classroom discourse as part of general pedagogical knowledge. Specifically, two main activities of productive classroom discourse are implemented (Walshaw & Anthony, 2008): *clarifying discourse and participation rights and responsibilities* in order to activate students in classroom discourse and make them equally responsible partners in the generation of successful classroom discourse (e.g. through open and elaboration questions) and *scaffolding student ideas*, especially in the form of providing students with constructive and learning oriented feedback. By helping teachers implement both activities in the classroom, the DVC aims to change teachers' perspective towards student learning processes and student ideas. Each cycle includes three workshops and one lesson video-taping (Figure 1). In the first workshop, teachers receive input on classroom discourse. Together with the facilitator and in collaborative practice, teachers adapt existing lesson plans by taking concrete strategies of productive classroom discourse into account. Hereby, the facilitator models productive classroom discourse. In the next step, teachers are videotaped while teaching the revised lesson. The facilitator chooses video excerpts and prepares them as basis for reflection in Workshop 2 and 3. The focus of Workshop 2 is on *Activity 1* (student

activation). Furthermore, teachers exchange ideas about the discursive roles of teacher and students and the way in which students are engaged. In Workshop 3, the focus is on *Activity 2* (scaffolding student ideas). Moreover, teachers exchange ideas about how to take up student responses and elaborations and how to give feedback. During the workshops, teachers watch selected clips, clarify questions, and jointly reflect their experiences by means of guiding questions (for further information regarding the facilitation see Gröschner, Seidel, Pehmer, & Kiemer, 2014).

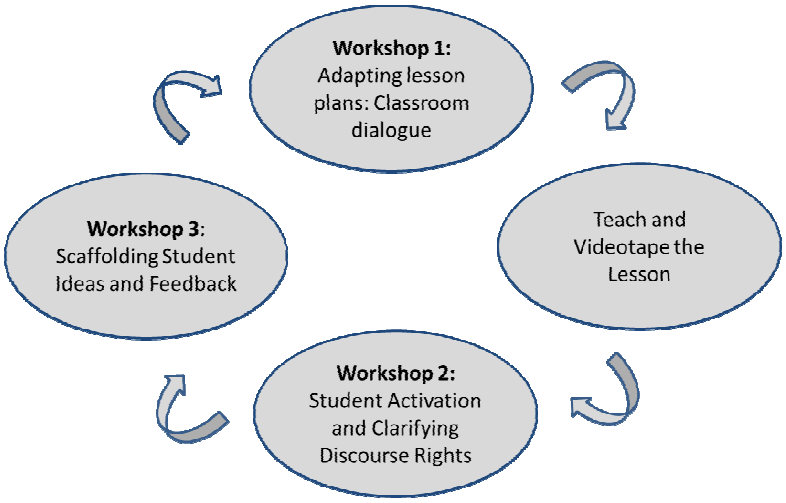

Figure 1. The Dialogic Video Cycle (Gröschner et al., 2014).

The Advanced Traditional Programme (ATP)

Traditional TPD programmes in Germany usually include single workshops on a topic of interest (Richter et al., 2011) and hardly refer to effective components of TPD. Such workshops barely offer opportunities to relate the workshops' content to teachers' own practice; minimising the potential for reflections as well as the acquisition and application of new teaching practices. For measuring the successful implementation of the DVC, we therefore decided to offer a second programme focusing on the topic of classroom discourse/teacher-student interaction, but based on single, mostly one-day workshops that were provided by the local TPD institute of the district. This was done to compare the DVC to the standard TPD German teachers are provided with and investigate its effectiveness. Beyond the regular TPD workshops, we invited teachers participating in this control group to meet twice in *Round Tables*, in which they could exchange their experiences together with the facilitator (who also provided the DVC). This "advanced" element allowed the facilitator to introduce the two DVC activities in this group as well. Furthermore, video-recordings of those meetings allowed us to control for effective components and check the extent to which they were implemented (see Gröschner, Seidel, Kiemer, & Pehmer, 2014).

In this overview article we present central findings with regard to the following aims of the research project:

1. To what extent are the relevant components of effective professional development implemented in the two different programmes (DVC; ATP)?
2. To what extent do teachers in the IG change their teaching performance regarding questioning (aspect of *Activity 1*) and feedback (aspect of *Activity 2*) in comparison to the CG?

3. To what extend differ students' perceptions of motivation between the groups at the end of the school year?

3. Design and Methodology

Participants

The sample of the study consisted of *N*= 10 teachers (with an age of *M*= 38 years, *SD*= 5.56) and their *N*= 226 students (47.8% girls, 52.2% boys) in ten ninth-grade science and math classrooms. Six teachers opted for the DVC and served as intervention group (IG). Four teachers chose the ATP and served as control group (CG). Teachers in both groups differed neither in age, nor teaching experience and gender.

The IG consisted of n=136 students, while *n*= 90 students were in the CG. The two groups differed regarding age (IG: M_{age}= 15.41, *SD*= .98; CG: M_{age}= 16.07, *SD*= .85) and gender (IG: 39.7% girls; CG: 60.0% girls), so that in data analyses those variables served as covariates.

Design

Data was obtained in a one-year longitudinal intervention design with multiple measurement points (Figure 2). The study was run in the school year 2011/2012. Treatment focused on the generic pedagogical concept of classroom discourse and encompassed a total of 22 hours (Gröschner, Seidel, Kiemer, & Pehmer, 2014). With regard to data collection, students were questioned on their interest in the subject, self-efficacy and domain-specific self-concept of ability at pre- and post-test. Teacher-student interactions during instruction were videotaped at pre- and post-test.

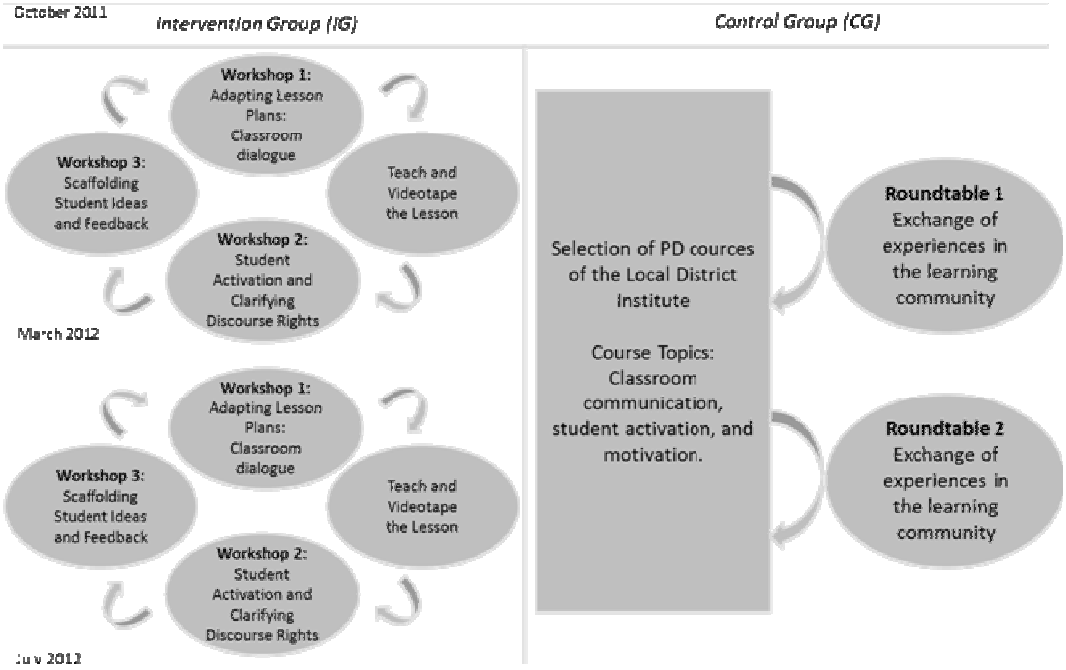

Figure 2. Implementation design (Gröschner et al., 2014).

Data sources

1. Implementation of effective TPD components.

All TPD meetings were videotaped and rated by two independent raters on a 3-point Likert-scale (0= "not observable", 1= "partially observable", 2= "clearly observable") according to the extent to which effective TPD components were implemented.

2. Teacher performance.

We videotaped one lesson at pre- and post-test for each teacher and analysed them using a low-inference coding scheme focusing on sight structures of classroom discourse (Pehmer, Kiemer & Gröschner, 2014). *Activity 1* was operationalised through teachers' questioning behaviour (encouraging and pressing students to engage in classroom discourse), while the *activity 2* was operationalised through teacher feedback. The following codes were developed:

- Teacher questioning: Independent raters coded each question in terms of whether it was an open ("*What do you think happens if we heat it up?*") question and fostering the elaboration of knowledge ("*How can you manage to increase the picture on the screen?*"). Inter-rater reliability on open questions was κ= .79 (direct agreement: 89.7%) and elaboration questions κ= .68 (direct agreement: 79.9%).
- Teacher feedback: Teacher statements after a student's response were characterized as constructive ("*That's a good strategy, try just focus some more on the mechanism*"), or whether the feedback focused on the learning process ("*Think again, what does the 4 tell you and what does the 2 tell you?*"), self-regulation ("*I know that in the test you will be able to manage the task.*") or on the task ("*Yes*"; "*Right*"). Reliability between coders was κ= .71 (direct agreement: 85.3%) for constructive feedback; κ= .68 (direct agreement: 82.2%) for feedback on learning processes, self-regulation and task.

3. Student learning outcomes

Directly after the videotaped lessons for pre- and post-test, students filled in a questionnaire with items on a 4-point Likert-scale (0= "fully disagree", 3= "fully agree") pertaining to interest in the subject (example: "*I am interested in mathematics/science*"), domain-specific self-concept of ability (example: "*In this subject I learn swiftly*") and self-efficacy (example: "*I am convinced that I can understand even the hardest contents in this subject*"). Internal consistency was satisfactory for all scales: interest α= .85/.93, self-efficacy α= .87/.88 and domain-specific self-concept of ability α= .82/.83.

4. Results

4.1. Implementation study

Regarding fidelity of implementation, two independent raters agreed that the implementation of effective components of TPD was successful in both groups (Figure 3). For the DVC the highest correlations were found for the pedagogical focus of *scaffolding students' ideas during classroom discourse* (ρ= 1.00) and *coherence* (ρ=1.00), followed by *activating students during classroom discourse* (ρ= .99), the *facilitation of teachers' video-based reflections* (ρ= .96) and *collective participation* (ρ= .86). The

lowest correlations were found for *active learning regarding realizing own teaching routines* (ρ= .80) and the *facilitator's guidance of the exchange among teachers* (ρ= .75). Both raters agreed highly on the DVC-specific aspects: *active learning regarding planning a lesson* (ρ= 1.00), *(video-based) reflection* (ρ= .95) and *transfer to teachers' own practices* (ρ= .99). Beyond the specific aspects of *active learning* and *reflection* in the DVC, the raters did not observe the *facilitation*, but the aspect of *transfer* in the CG (for further results and to access the rating scheme see Gröschner, Seidel, Kiemer, & Pehmer, 2014).

Implementation Aspects	**Number of items**	**α**	**IG**				**CG**				r_s
			M	***SD***	***Min***	***Max***	***M***	***SD***	***Min***	***Max***	
Pedagogical Focus: Student activation	1	-	1.58	.67	0	2	2.00	.00	0	2	.99**
Pedagogical Focus: Scaffolding students' ideas	1	-	1.83	.39	1	2	1.50	1.00	0	2	1.00**
Coherence	1	-	2.00	.00	2	2	2.00	.00	2	2	1.00**
Collective Participation	3	.75	1.97	.10	1.67	2	1.33	.27	1	1.67	.86**
Active Learning: Realizing teaching routines	1	-	1.58	.52	1	2	0	.00	0	0	.80*
Active Learning: Planning	1	-	1.17	.72	0	2	0	.00	0	2	1.00**
Facilitation: Exchange among teachers	1	-	1.75	.45	1	2	0	.00	0	0	.75*
Facilitation: Guiding video-based reflections	1		1.08	.90	0	2	0	.00	0	0	.96**
Reflection	3	.94	1.17	.88	0	2	0	.00	0	0	.95**
Transfer	2	.55	1.88	.31	1	2	1.50	.58	1	2	.99**

Figure 3. Implementation of TPD components in both programs (Gröschner et al., 2014).
**p< .01; *p< .05; N_{DVC} = 6 videos; N_{ATP} = 2 videos (two independent raters).

4.2. Teacher performance

All reported results are relative counts of the respective subcategory in relation to the total in that category. Figure 4 gives descriptive statistics and non-parametric analyses of variance for teachers' questioning behaviour (*Activity 1*) and feedback (*Activity 2*) for both groups. Results show, that for teachers' *questioning behaviour* no change in the number of open questions in the IG could be found; while CG teachers decreased their use of open questions. This trend did not reach significance ($F_{open}(1)$= .56, n.s.; $F_{closed}(1)$= .56, n.s.). Furthermore, the findings show that IG-teachers slightly increased their use of

questions which foster students' elaboration of knowledge, but with no significant difference to CG teachers who show a drop ($F_{elaboration}(1)= 1.76$, n.s.).

Regarding teachers' *feedback behaviour* a significant increase in constructive feedback ($F(1)= 9.20$, $p< .01$, $\Delta RTE= .39$) in the IG could be found. More specifically, IG-teachers significantly increased their use of feedback on learning processes ($F(1)= 6.04$, $p< .05$, $\Delta RTE= .31$), as well as feedback on self-regulation ($F(1)= 3.94$, $p< .05$, $\Delta RTE= .22$) in comparison to the CG. At the same time, they drew significantly less on feedback on task ($F(1)= 9.72$, $p< .01$, $\Delta RTE= -.22$) (for detailed results regarding teacher performance see Kiemer, Gröschner, Seidel, & Pehmer, 2014; Pehmer, Gröschner, & Seidel, 2014).

		Pre-test			**Post-test**		
		M	***SD***	***Mean rank***	***M***	***SD***	***Mean rank***
Aspects of *Activity 1*							
Open questions	*IG*	.40	.21	12.91	.39	.17	12.67
	CG	.23	.17	8.88	.17	.09	5.25
Questions which foster elaboration of knowledge	*IG*	.38	.15	10.42	.40	.18	11.58
	CG	.48	.23	12.5	.24	.21	7.0
Aspects of *Activity 2*							
Constructive feedback	*IG*	.21	.07	8.00	.39	.14	15.92
	CG	.29	.11	12.00	.15	.10	4.63
Feedback on learning processes	*IG*	.08	.05	8.92	.19	.10	15.8
	CG	.08	.06	8.13	.08	.08	8.38
Feedback on self-regulation	*IG*	.12	.06	11.5	.23	.11	15.83
	CG	.04	.02	6.88	.02	.02	4.63
Feedback on task	*IG*	.80	.07	9.5	.59	.21	5.12
	CG	.89	.07	15.0	.91	.09	15.5

Figure 4. Descriptive statistics teacher relative percentage of teachers' questions and feedback at pre- and post-test for IG and CG.
n(IG) = 6, *n(CG)* = 4; mean, std.dev., mean rank (Kiemer et al., 2014; Pehmer et al., 2014).

3. Student learning outcomes

Results of the analysis of student questionnaires show that while there was no significant difference at pre-test between the groups; significant differences occurred at post-test. A multivariate analysis of covariance showed a significant main effect for treatment ($F_{treatment}(3,172)= 3.11$, $p< .05$, $\eta^2= .05$) and significant univariate effects for all three

variables: *interest in the subject* ($F_{interest}(1,174)= 5.10$, $p= .03$, $\eta^2= .03$), *self-efficacy* ($F_{self\text{-}efficacy}(1,174)= 7.95$, $p= .01$, $\eta^2= .04$, and *domain-specific self-concept of ability* ($F_{self\text{-}concept}(1,174)= 3.11$, $p= .08$, $\eta^2= .02$) (for detailed results see Kiemer et al., 2014).

5. Discussion

In this paper, we gave an overview about a new TPD programme on productive classroom discourse - the Dialogic Video Cycle. As interventions in TPD research are rare and research lacks evidence about the implementation of effective components in newly developed programmes, we investigated to what extent effective components were implemented in the DVC by comparing it with a control group of teachers who participated in a rather traditional form of TPD in Germany.

Regarding the implementation of effective components of TPD derived from previous research (Desimone, 2009; Wilson, 2013), it was shown that the targeted TPD components were overall implemented successfully in the DVC. Independent raters furthermore strongly agreed on the presence of elements such as video-based reflections and transfer (Borko, Jacobs, Eiteljorg & Pittman, 2008). Regarding both concepts it was shown that *pedagogical focus*, *duration*, and *coherence* were fully implemented in the DVC and the traditional programme. Opportunities for *collective participation* and *facilitation* were especially observed in the DVC workshops. Both raters observed *active learning* and *reflection* only for the DVC group, but found transfer also to some extent present in the CG. In more detail, specific aspects addressed in the DVC, such as *lesson planning* (Workshop 1) and *video-based reflections* (Workshops 2 and 3), were also successfully implemented and could be observed in the DVC workshops.

The video analysis of teachers' discourse behaviour at pre- and post-test showed that IG-teachers changed their *questioning* and *feedback behaviour* positively. The finding of a significant increase in constructive feedback which is focusing on students learning processes and self-regulation shows that this aspect of productive classroom discourse seems apparently more likely to be demonstrated in observed practices (van den Bergh, Ros & Beijaard, 2013) than a more open and cognitively demanding questioning style (Franke et al., 2009). Thus, our findings indicate that questioning may be a more-difficult-to-adapt teacher practice; as a teacher's style of asking questions is very much a routine (Oliveira, 2010). Teachers, sometimes, struggle with asking open questions because this provides students with more opportunities (and also time) to express own ideas or to make inferences and synthesize ideas (Franke et al., 2009; Mercer & Dawes, 2014). For teachers this means that they need to re-act very spontaneously, which is a further challenge for teacher feedback (Cazden, 2001). Furthermore, the results suggest that even though the CG received a form of TPD and engaged in learning on productive classroom discourse, this learning did not transpire into the application of new knowledge to their classrooms and thus may account for the decrease in productive classroom discourse practices. It might be supposed that the DVC with its close connection to teachers' own classrooms, the opportunity for video-based reflection and possibility for rehearsal is a better form of TPD to acquire new skills than are traditional workshops.

Participation in the DVC furthermore shows implications with regard to positive changes of students' *interest in the subject*, *domain-specific self-concept of ability*, and *self-efficacy*. This finding confirms that implementing elements of productive classroom discourse is an appropriate mean for countering the repeatedly found decrease in interest

(Eccles & Roeser, 2009). Furthermore, the increasing use of instructional, meaningful feedback appears to help students to build a more positive concept of themselves in a specific domain over the course of a school year, as they receive information about themselves by significant others (Chen, Thompson, Kromrey & Chang, 2011). Although, findings of this first study on the DVC (with a small sample of teachers) need to be carefully interpreted, the findings on student outcomes are remarkable as incidents of classroom discourse are intrinsically situational, while interest in the subject, domain-specific self-concept of ability, and self-efficacy are conceptualised as more enduring, dispositional characteristics. Thus, the DVC seems to be a powerful tool to foster teacher learning in a practice-oriented, reflection-based learning environment (Gröschner, Seidel, Kiemer, & Pehmer, 2014).

6. Conclusions and reflections

The development, evaluation and scaling of innovative TPD programmes fostering teacher learning and aiming to improve student learning is a prime concern of research on teaching and teacher education. The Dialogic Video Cycle promises to be an effective TPD programme to foster teachers' skills in classroom discourse, especially compared to traditional forms of TPD in Germany. Reflecting upon the DVC, this first study encourages us, now, to further think about new directions and perspectives. Possible next steps could be situating the DVC at single schools and including the whole faculty, not just individual teachers from single departments. In this context, possible future research could also include scaling-up questions, like the training of teacher leaders as facilitators for the DVC. In order to obtain more specific data on the internal workings of the DVC and meaningful aspects of productive classroom discourse, promising avenues for future projects could be to separate the two activities of productive classroom discourse and focus on just one in order to specify them more explicitly and to investigate in more detail, to what extent teaching in a more dialogic way goes along with a kind of *assistance dilemma*, that is described in the literature (Koedinger & Aleven, 2007) as a challenge of guiding students occasionally too much or too little. Further unanswered questions are such about the optimal duration of the DVC, the incremental value of video-based reflections as well as the role of the facilitator and the value of collaboratively exchanging experiences among teachers for the success and effectiveness of the DVC. Lastly, student achievement as a further measure for student learning outcomes should be considered in upcoming research on the effectiveness of the DVC.

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