FACILITATOR MODERATION STRATEGIES FOR SUPPORTING TEACHER LEARNING IN DISCUSSIONS

Victoria Shure, Bettina Roesken-Winter

University of Münster

Mathematics teacher professional development (TPD) has received increasing attention in recent years, with a focus on supporting teacher learning through discussion. Through a situated examination with a fictional TPD situation, this study explores how facilitators (N = 116) envision supporting teacher learning through their discussion moderation strategies. Findings highlight that the facilitators overwhelmingly favoured probing teachers' thinking and eliciting teachers' thinking as most supportive and viewed making their own contributions and, to a lesser extent, orienting the teachers to the thinking of others as less favourable. The study provides insights into facilitators' discussion-leading with implications for the preparation of facilitators for future leading of discussions in TPD.

INTRODUCTION

In recent years, there has been an increased emphasis on mathematics teacher professional development (TPD), especially concerning the role of facilitators in supporting teacher learning (e.g., Borko et al., 2011). In particular, research has indicated that theory inputs and discussions alone can help improve teachers' knowledge but have less of an impact on their classroom practices. However, when combined with teaching experiments and approximations of practice with feedback, teachers can reflect on and improve their practice (Joyce & Showers, 2002). These features of TPD are recognized as characteristics of high-quality learning situations (e.g., Cohen-Nissan & Kohen, 2023; Prediger & Selter, 2024). While more is known about what constitutes high-quality TPD, fewer large-scale studies on the moderation of TPD have been conducted (e.g., Pöhler-Friedrich et al., 2024). The current study therefore aims to examine what facilitators envision for moderating discussions that create learning opportunities for teachers in a TPD program combining teaching experiments and approximations of practice, reflections, and discussions.

THEORETICAL FRAMEWORK

Features of high-quality TPD

In recent years, various studies have highlighted the factors that contribute to the effectiveness and high quality of TPD (e.g., Barzel & Selter, 2015; Cohen-Nissan & Kohen, 2023; Desimone, 2009; Prediger & Selter, 2024; Roesken-Winter et al., 2021). Cohen-Nissan and Kohen (2023), for example, emphasized the importance of a content focus, as well as opportunities for teachers to engage in active learning and

2026. In H. Krzywacki, M. Hähkiöniemi, E. Haataja, M.S. Hannula & P. Hästö (Eds.). *Proceedings of the 49th Conference of the International Group for the Psychology of Mathematics Education: Research Reports*, pp. 1355-1362. PME.

collaboration, and to practice teaching models and modelling of instruction, phases of feedback and reflection. Similarly, building upon research into effective TPD (e.g., Barzel & Selter, 2015; Lipowsky & Rzejak, 2015), Prediger and Selter (2024) expounded upon principles for high-quality TPD that include a competence orientation, focusing on productive practices for typical instructional demands. In a similar vein to Cohen-Nissan & Kohen (2023), Prediger and Selter (2024) emphasized an experiment model connecting inputs, teaching experiments, and reflections in TPD, as well as a case-focused approach enabling teachers to "work on cases from classrooms and experiment with new practices" (p. 23). Furthermore, they emphasized a participant orientation that focuses on working with participants' perspectives and needs, as well as collaboration stimulation that serves to motivate mathematics-related teacher cooperation and reflection stimulation to provide teachers with the opportunity to "reflect individually and together on instructional practices" (p. 23).

Facilitating high quality TPD with a focus on moderation strategies

In considering how facilitators can bring these aspects of effective TPD into their praxis, there are several frameworks that address various aspects of TPD facilitation. Elliott et al. (2009), for example, adapted the Stein et al. (2008) framework for orchestrating productive mathematical discussions for TPD, engaging teachers in mathematical discussions through practices such as anticipating teacher responses to rich mathematical tasks, monitoring their responses to the tasks during the exploration phase, selecting work to share in whole-group discussions, sequencing work to be discussed, and helping the group make mathematical connections to develop powerful mathematical ideas. In terms of how facilitators lead discussions surrounding video in TPD, several studies have proposed frameworks for the facilitation of TPD involving video (e.g., Borko et al., 2014; van Es et al., 2014), emphasizing how facilitators plan and implement the orchestration of video clips, for example. These practices include eliciting teachers' thoughts on the given lesson segment and exploring evidence for their claims (Borko et al., 2014).

While the aforementioned frameworks consider discussions specific to video clips, less research pertains to other discussions within the context of TPD. Based on a framework concerning moderation practices specific to discussion-leading of classroom instruction enabling students to develop a collective understanding (Shaughnessy et al., 2021), we adapted these moderation strategies for facilitators at the TPD level. These strategies include: making contributions; eliciting teacher thinking; probing teacher thinking; and orienting teachers to the thinking of others. We further specified that the strategy of making contributions has the least potential to support teacher learning, followed by eliciting teacher thinking, which emphasizes recall and procedures. Probing teacher thinking, highlighting teachers' reasoning, and lastly the strategy, orienting the teachers to the thinking of others, represent the strategies with greater potential to support teacher learning, with the latter being the most effective.

As little is known about the facilitation of TPD in detail, and as research concerning facilitators has more often been conducted on a smaller scale, considering the experiences of novice facilitators (e.g., Pöhler-Friedrich et al., 2024), the current study aims to provide insights into (experienced) facilitators' moderation strategies for leading effective TPD that support teacher learning during TPD discussions on a larger scale. The following questions thereby guided this research:

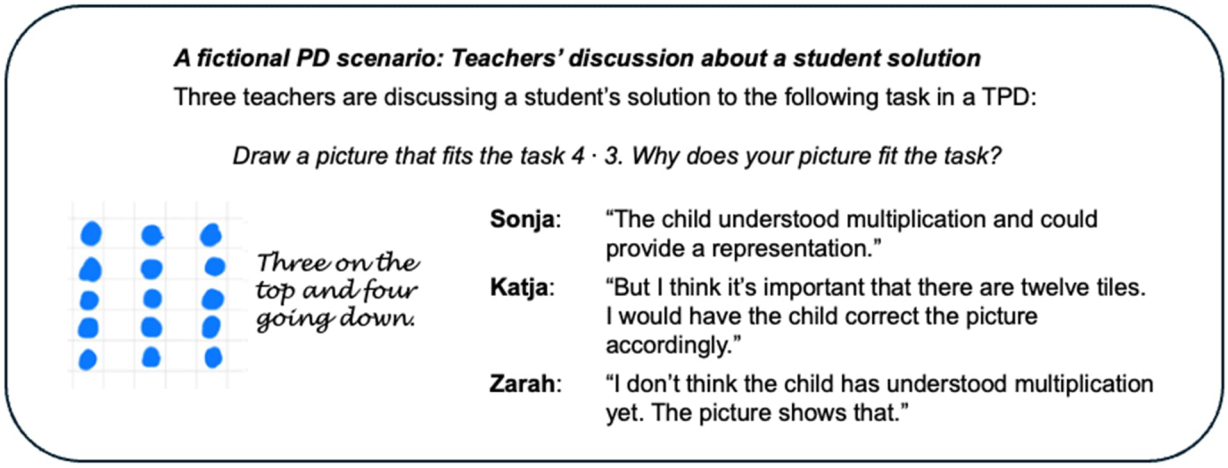
RQ1: What moderation strategies do facilitators consider most and least supportive for teacher learning in discussions?

RQ2: What justification do they provide for their selection?

METHODS

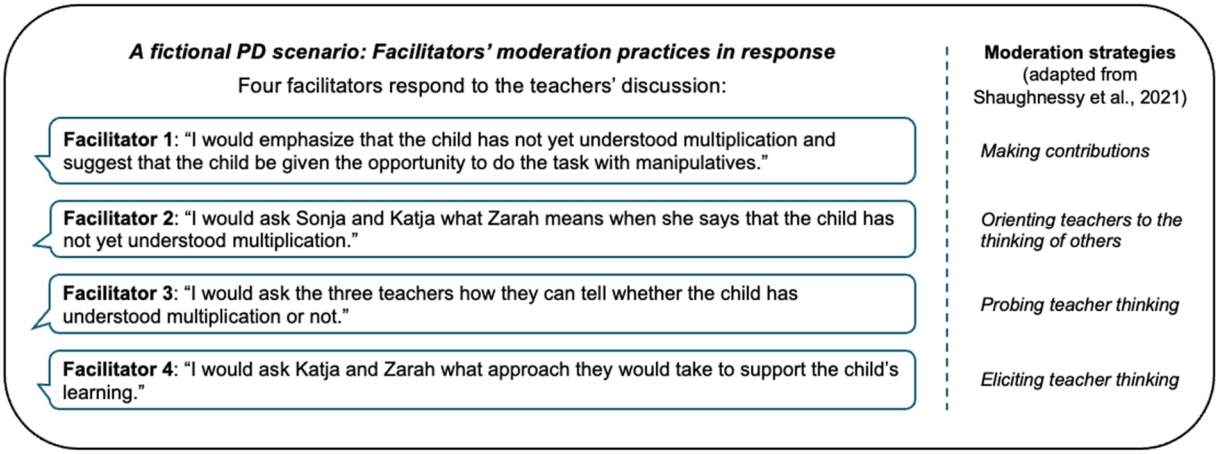
The data for this study were drawn from *QuaMath* (Prediger & Selter, 2024), a ten-year FPD/TPD program in Germany that began in September 2023 and has the long-term goal of improving mathematics instructional quality. In total, 116 facilitators (N = 116), who are also primary and secondary school mathematics teachers, participated in the current study. These facilitators are participating in a facilitator preparation program and will later lead PD courses for mathematics teachers that include teaching experiments and reflection sessions for the teachers. The facilitators' teaching experience ranged from one to 37 years (M = 19) and their facilitation experience ranged from no experience to 21 years (M = 4). The facilitators were provided with the instrument to examine how they envision a (fictional) TPD discussion that is supportive for teacher learning.

Figure 1: Student task and solution and three teachers' discussion about the solution.



Following the teachers' discussion, the facilitators were then presented four responses displaying different moderation strategies (Figure 2). The facilitators were then provided with the following tasks: 1) Select the response that is most supportive for teacher learning. Explain why; 2) Select the response that is least supportive for teacher learning. Explain why.

Figure 2: Facilitator moderation strategies in response to the teachers' discussion, assigned to the four moderation strategies as adapted from Shaughnessy et al. (2021)



To analyse the selections for RQ1, first the frequency of each selected strategy was calculated. Second, qualitative content analysis was conducted to analyse the justifications provided by the facilitators (RQ2). The aspects of high-quality TPD (Barzel & Selter, 2015; Prediger & Selter, 2024) were utilized for this analysis, yielding the following (identifiable) categories: competence and participant orientation, representing the demands for teachers to be learned and working with the participants' needs, respectively; case focus, incorporating examples from practice; collaboration and reflection stimulation, denoting encouraging cooperation amongst the participants and reflecting individually and together, respectively. In addition, inductively developed categories emerged from the data and are presented in the results section. The facilitators' responses could contain more than one aspect in a justification, such that the frequency of the identified aspects of the justifications amounted to more than the total number of facilitator responses. These coding processes were conducted using collaborative coding (Onrubia et al., 2022), following consensual intercoder agreement (Creswell & Creswell, 2022) with discussion amongst the research team, including continuous debriefing sessions (Shenton, 2004).

RESULTS

The following outlines the trends that were visible in the selected moderation strategies for most and least supportive for teacher learning (RQ1) and the reasoning that accompanied these trends (RQ2). Fourteen facilitators selected more than one strategy, so the frequency of strategies is higher than the total number of facilitators.

In terms of the most supportive moderation strategies, the majority of the facilitators selected either *probing teacher thinking*, or *eliciting teacher thinking* (Table 1). Regarding the selection of the least supportive moderation strategies, the facilitators overwhelmingly selected, *making contributions*, as the least supportive practice. The moderation strategies in Table 1 are arranged in order their potential to support teacher learning, as adapted from the Shaughnessy et al. (2021) framework. Thus, the

facilitators' choices regarding the least supportive strategy were in line with the framework's potential, whereas the picture was more diverse for the most supportive strategies. In this case, the highest category was barely chosen by the facilitators.

Table 1: Facilitators' selection of moderation strategies as most and least supportive for teacher learning (in percentage and frequency)

Moderation strategies	**Facilitators' selections of**	
	most supportive strategy (129)	**least supportive strategy (117)**
Making contributions (Facilitator 1 – F1)	0.8% (1)	86.3% (101)
Eliciting teacher thinking (Facilitator 4 – F4)	24.8% (32)	3.4% (4)
Probing teacher thinking (Facilitator 3 – F3)	65.9% (85)	-
Orienting teachers to the thinking of others (Facilitator 2 – F2)	8.5% (11)	6.0% (7)
No selection	-	4.3% (5)

In terms of the justifications provided for the selected most and least supportive moderation strategies of teacher learning, some of the aspects of high-quality TPD, as defined by Barzel and Selter (2015) and Prediger and Selter (2024), could be recognized. Table 2 provides an overview of these aspects, supplemented by additional categories identifiable in the facilitators' justifications.

Table 2: Aspects of high-quality TPD and additional categories, appearing in facilitators' justifications of moderation strategies (in percentage and frequency)

Aspects of high-quality TPD	**Aspect in facilitators' justifications for selecting the**	
	most supportive strategy (n = 203)	**least supportive strategy (n = 180)**
Competence orientation	8.6% (10)	2.6% (3)
Participant orientation	40.5% (47)	51.7% (60)
Case focus	2.6% (3)	0% (0)
Collaboration stimulation	19.0% (22)	9.5% (11)

Reflection stimulation	20.7% (24)	12.9% (15)
Additional categories		
Conceptual orientation	25.9% (30)	12.9% (15)
Cognitive activation	13.8% (16)	14.7% (17)
Showing esteem for participants	13.8% (16)	20.7% (24)
Promoting discussion	15.6% (18)	7.8% (9)
Classroom level (not relating to TPD)	4.3% (5)	10.3% (12)
No justification provided	10.3% (12)	12.1% (14)

More than forty percent of the selected most supportive strategies centred on a participant orientation. The following response justifies the selection of F3 (Table 1) and illustrates this orientation, underlining F3 as a means of better understanding the needs of the participating teachers: “Impulse from the facilitator 3. I find that this impulse allows me to learn more about my colleagues’ ways of thinking, and then I can provide further impulses and comment on their statements.” This emphasis on better understanding the needs of the participants appeared frequently in this manner.

While F3, was selected more than any other response, facilitators provided a range of justifications for this selection. For example, a facilitator justified stating: “Facilitator 3, as no evaluation takes place here,” highlighting an emphasis on showing esteem for the participants in not wanting to place judgment on the participants’ ideas. Similarly, another facilitator underscored the importance of not including an evaluative stance in responding to the teachers: “If I had to choose one response, I would choose No. 3, because here the understanding of multiplication can be discussed again and none of the opinions are judged as wrong or right.” In this example, a conceptual orientation was also recognized, as the discussion of understanding multiplication was seen as an important aspect of this moderation strategy.

In the facilitators’ justifications for their selection concerning the least supportive moderation strategy, the participant orientation was mentioned even more frequently. In these instances, facilitators noted the lack of recognition of the individual and heterogeneous needs of the participants, as well as lack of active involvement of the participants in the learning process. The following examples, in which F1, *making contributions*, was selected by both facilitators, highlight this aspect that they found to be missing, “F1: too directive, the statements made by the teachers are not addressed,” and “I find the first statement the least suitable, as it is prescriptive and does not support the participants in their thinking.”

Furthermore, in addition to the frequent mentioning of the lack of involvement of the participants and recognition of their individual needs, the facilitators frequently justified their selection by noting the lack of esteem for participants as an obstacle for learning. The following example highlights this aspect: "F1: directly evaluated and to a certain extent prescribed. Teachers learn more when they question their own statements." While a majority of justifications with lack of esteem for participants was provided for F1, six facilitators highlighted this aspect when justifying their selection of F2, *orienting teachers to the thinking of others*.

CONCLUSIONS

The results of the present study showed that the facilitators recognized *probing teacher thinking* as the moderation strategy with the capacity to support teachers' learning in discussions. This recognition is in line with the adapted framework for discussion leading. However, *orienting teachers to the thinking of others*, the strategy with the most potential for supporting learning, was selected in less than ten percent of the selected strategies. This strategy was selected, instead, as the least supportive for teacher learning. However, in terms of the facilitators' selection of the least supportive strategy, their overwhelming selection of *making contributions* is in line with the adapted framework, as this strategy provides learners with the least opportunity for learning as it does not provide for self-driven growth. In terms of the justifications provided by the facilitators, aspects of high-quality TPD were visible in addition to a frequent emphasis on showing esteem for the participants. Thus, while the selection of the moderation strategies often aligned with those having the capacity for more/less support of learning, the reasoning behind the facilitators' selection was quite diverse, and contained aspects not relevant to high-quality TPD, which suggests that more explicit discussion of moderation strategies and their purposes in relation to aspects of high-quality TPD could be a fruitful part of qualification programs for facilitators.

Acknowledgment

This research was funded within the project *QuaMath*, financed by the Standing Conference of the Ministers of Education and Cultural Affairs (KMK) in Germany.

References

Barzel, B., & Selter, C. (2015). Die DZLM-Gestaltungsprinzipien für Fortbildungen [The DZLM design principles for professional development]. *Journal für Mathematik-Didaktik, 36*(2), 259–284. https://doi.org/10.1007/s13138-015-0076-y

Borko, H., Koellner, K., & Jacobs, J. (2014). Examining novice teacher leaders' facilitation of mathematics professional development. *The Journal of Mathematical Behavior, 33*, 149-167. https://doi.org/10.1016/j.jmathb.2013.11.003

Borko, H., Koellner, K., Jacobs, J., & Seago, N. (2011). Using video representations of teaching in practice-based professional development programs. *ZDM - Mathematics Education, 43*(1), 175–187. https://doi.org/10.1007/s11858-010-0302-5

Cohen-Nissan, O., & Kohen, Z. (2023). Mathematics coordinators as school team PD leaders before and during COVID-19. *Teaching and Teacher Education*. https://doi.org/10.1016/j.tate.2022.103921.

Creswell, J. W., & Creswell, J. D. (2022). *Research design: Qualitative, quantitative and mixed methods approaches*. (6th. Ed.). Sage.

Desimone, L. M. (2009). Improving Impact Studies of Teachers' Professional Development: Toward Better Conceptualizations and Measures. *Educational Researcher*, *38*(3), 181–199. https://doi.org/10.3102/0013189X08331140

Elliott, R., Kazemi, E., Lesseig, K., Mumme, J., Carroll, C., & Kelley-Petersen, M. (2009). Conceptualizing the Work of Leading Mathematical Tasks in Professional Development. *Journal of Teacher Education*, *60*(4), 364–379. https://doi.org/10.1177/0022487109341150

Joyce, B., & Showers, B. (2002). *Student achievement through staff development*. Longman.

Lipowsky, F., & Rzejak, D. (2015). Key features of effective professional development programs for teachers. *Ricercazione — Six-monthly Journal on Learning. Research and Innovation in Education*, *7*(2), 27–51.

Onrubia, J., Roca, B., & Minguela, M. (2022). Assisting teacher collaborative discourse in professional development: An analysis of a facilitator's discourse strategies. *Teaching and Teacher Education*, 113, 1–18. https://doi.org/10.1016/j.tate.2022.103667

Pöhler-Friedrich, B., Prediger, S., Schwarts, G., & Karsenty, R. (2024). Learning to leverage teachers' ideas: Facilitators' growth in moderation practices with simultaneously strong goal focus and participant focus. *Journal of Mathematics Teacher Education*. https://doi.org/10.1007/s10857-024-09660-4

Prediger, S., & Selter, C. (2024). Establish shared visions and support productive adaptations on all levels: Aims, strategies, and architecture of a nationwide implementation program. *Implementation and Replication Studies in Mathematics Education*, *4*(1), 15–49. https://doi.org/10.1163/26670127-bja10020

Roesken-Winter, B., Stahnke, R., Prediger, S., & Gasteiger, H. (2021). Towards a research base for implementation strategies addressing mathematics teachers and facilitators. *ZDM - Mathematics Education*, *53*(5), 1007-1019. https://doi.org/10.1007/s11858-021-01220-x

Shaughnessy, M., Garcia, N. M., O'Neill, M. K., Selling, S. K., Willis, A. T., Wilkes, C. E., Salazar, S. B., & Ball, D. L. (2021). Formatively assessing prospective teachers' skills in leading mathematics discussions. *Educational Studies in Mathematics*, *108*(3), 451–472.

Shenton, A. (2004). Strategies for ensuring trustworthiness in qualitative research projects. Education for Information, 22, 63–75. https://doi.org/10.3233/EFI-2004-22201

Stein, M. K., Engle, R. A., Smith, M. S., & Hughes, E. K. (2008). Orchestrating Productive Mathematical Discussions: Five Practices for Helping Teachers Move Beyond Show and Tell. *Mathematical Thinking and Learning*, *10*(4), 313–340.

van Es, E.A., Tunney, J., Goldsmith, L., & Seago, N. (2014). A Framework for the Facilitation of Teachers' Analysis of Video. *Journal of Teacher Education*, *65*, 340 - 356.