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# Facilitator practices during PD courses in response to teacher orientations for supporting at-risk students

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*The orientations that teachers possess impact their instructional decisions. Accordingly, PD facilitators need to be able to identify and respond to these orientations, especially when teachers demonstrate orientations contradictory to PD principles. Facilitators are thus faced with the challenge of balancing PD content goals and atmospheric goals. We first examine teacher orientations at the beginning of a PD. Second, as facilitators' situative goals and orientations become apparent in facilitators' practices, we examine facilitators' practices applied in response to teachers' orientations. Results reflect previous evidence of teachers' procedural, syllabus bound, short-term, and individual orientations. Our research furthermore revealed various practices facilitators use to respond to teachers' various orientations such as confirming teachers' statements, implicitly and explicitly referring to PD principles, and using examples from their own lives or instruction.*

*Keywords: Professional development, facilitator practices, teacher orientations.*

## Introduction

Teacher orientations are crucial for instructional decisions in the classroom. Thus, if teachers view, for example, mathematical proficiency as implementing different mathematical procedures, they will highlight different instructional goals in comparison to teachers who accentuate conceptual understanding (e.g. Schoenfeld, 2011; Zohar & Dori, 2003). In the PD program *Mastering Math*, which represents the context of our study, the focus centers on fostering teachers' ability to enhance at-risk students' understanding of mathematical concepts. As orientations such as diagnostic, conceptual, long-term and communicative were identified as decisive to enhance at-risk students' understanding (Prediger et al., 2019), these are the focus of the PD. Accordingly, the facilitators need to identify what orientations teachers possess and consider how they can respond in order to move forward towards the content goal of the PD. In the theory section, we first elaborate on teacher orientations for supporting at-risk students and, second, on goals and orientations as part of facilitator practices. In the empirical part of the paper, we present data from three PD courses to scrutinize teacher orientations and patterns of facilitator practices in response to these orientations.

## Teacher orientations for supporting at-risk students

Teacher orientations can have consequences for supporting at-risk students, especially in building conceptual understanding. In expanding upon prior conceptualization of orientations, for instance by Schoenfeld (2011), Prediger (2019) created a framework of mathematics teacher expertise that

includes orientations as one of five facets: “Orientations refer to content-related and more general beliefs that implicitly or explicitly guide the teachers’ perceptions and prioritisations of jobs“ (p. 370). Evidence on teacher orientations and practices connected to at-risk students, revealed that teachers often focus on assisting students in developing procedural knowledge and less so on constructing conceptual knowledge (Beswick, 2007; Wilhelm et al., 2017; Zohar et al., 2001). Furthermore, teachers tend to base requirements on those dictated by the school syllabus, highlight short-term mastery instead of working toward long-term goals (Moser Opitz, 2007; Prediger et al., 2016), and emphasize individual student issues (Krähenmann et al., 2019) as opposed to rich discourse including all students and their products (Karsenty et al., 2007). According to these results, the following contrasting orientations can be used to identify the practices teachers show to support at-risk students’ understanding: diagnostic or syllabus-bound orientation; conceptual or procedural orientation; long-term or short-term orientation; and communicative or individualistic orientation. Thereby, empirical studies identified orientations based on a diagnostic, conceptual, long-term and communicative approach as supportive to enhance at-risk students understanding (Prediger et al., 2019).

### **Goals and orientations as part of facilitator practices**

In terms of what (novice) PD facilitators need to know and do to be able to provide successful PD programs for mathematics teachers, researchers have increasingly examined what constitutes necessary PD facilitator knowledge and practices (Borko et al., 2014; Lesseig et al., 2017). In view of diagnostic, conceptual, long-term and communicative orientations as the basis for the PD guiding principles and forming the content goals of the PD within the context of *Mastering Math*, the facilitators need to deal with diverse teacher orientations while targeting these PD content goals. Whether the PD content goal is reached depends on the practices that are “recurrent patterns of a facilitator’s utterances and actions” (Prediger et al., 2021) when conducting a PD. Practices are characterized by pedagogical tools facilitators use such as PD activities and their categories for noticing and thinking that can be based on the content knowledge and pedagogical content knowledge facilitators bring to the PD. Furthermore, the situative goals facilitators pursue, such as content goals or atmospheric goals, depend on facilitators’ orientations, such as goal orientation, participant orientation, or esteem for participants, and are part of facilitators’ practices (Prediger et al., 2021). According to prior case studies on facilitators’ practices in a PD, situations can occur that let different goals compete with one another and challenge facilitators to navigate between them or turn from one to another (Prediger & Pöhler, 2019). In the light of the PD program *Mastering Math*, facilitators may be faced with such a situation, in that teachers show orientations contradictory to the PD guiding principles (for example a procedural instead of a conceptual orientation), challenging facilitators to balance content goals and atmospheric goals. As facilitators’ situative goals and orientations become apparent in facilitators’ practices, we examine the practices applied in response to teacher orientations and the patterns of practices facilitators show. Against the aforementioned theoretical background, we pursue the following research questions:

RQ1: What orientations for supporting at-risk students do teachers show during PD courses related to this topic?

RQ2: What practices do the PD facilitators apply to respond to teachers’ orientations?

RQ3: What patterns of facilitator practices and underlying situative goals can be detected?

## Methodology

### Participants

Three PD groups (PD 1: N=17, PD 2: N=10; PD 3: N= 9) of the *Mastering Math* PD program participated in the study. The participating teachers possess different mathematical or non-mathematical backgrounds and different experiences in teaching primary students, as some attended a primary teacher education program and completed their internship, and some are teaching out-of-field. For each of the three PD groups, two PD facilitators were responsible to conduct the PD as a tandem. The facilitators are teachers themselves, and teach mathematics either in primary or secondary school. They also draw on different teaching experiences and various educational backgrounds, ranging from primary teacher education programs including an internship, to a major in mathematics or in special education. All facilitators received the same preparation to conduct the PD, then provided similar PD content and used similar methods.

### Data collection and analysis

Within each PD group, a group discussion was conducted, videotaped and transcribed. Within this PD activity, teachers were asked to situate themselves in relation to the juxtaposition of all orientations (for example “It is important for at-risk students to find out if they have mastered basic arithmetic skills” for procedural orientation, or “It is important for at-risk students to find out if they have understood basic concepts and representations” for conceptual orientation).

As a first step, the individual teacher utterances were analyzed utilizing a coding system with the aforementioned teacher orientations for supporting at-risk students (see table 1) following a deductive approach. The transcripts were coded by two experts in the field of mathematics education. Inter-coder-reliability over all groups showed sufficient consistency (Kappa=0.98) (McHugh, 2012). Absolute and relative frequencies are reported to quantify the orientations. As a second step, all statements of facilitators in response to teachers’ statements were coded by two researchers, using an inductive approach. First, the two researchers coded the transcript of PD group 1 independently. Second, the identified categories were discussed and revised, resulting in codes seen in the first column of Table 2. Third, the transcripts of the three PD groups were coded, according to the inter-coder-reliability with a sufficient consistency (PD group 1: Kappa=1.0; PD group 2: Kappa=0.89, PD group 3: Kappa=0.93) (McHugh, 2012). Additionally, we coded the facilitators’ practices in response to the teacher orientations and report absolute frequencies. An inductive approach was used and resulted in four categories (see first column of Table 3, applied by two coders who fully agreed).

### Results

According to the analysis of teacher orientations that were visible in the group discussions in the three PDs (RQ1), some teachers had, to an extent, internalized some of the guiding principles of the PD program (see the green marked orientations), including supporting conceptual learning, focusing on long-term mastery, and establishing a communicative atmosphere that involves all students. These orientations were most visible overall in the PD groups (see Table 1). In regard to the individual PD groups, however, differences can be seen in terms of the main orientations.

**Table 1: Teacher orientations overall and in the three PD groups in percentages**

Teacher orientation	All PD groups (in %)	PD group 1 (in %)	PD group 1 (absolute instances)	PD group 2 (in %)	PD group 2 (absolute instances)	PD group 3 (in %)	PD group 3 (absolute instances)
Conceptual	15.56	22.73	5	0	0	12.50	2
Both	6.67	4.54	1	0	0	12.50	2
Procedural	6.67	9.09	2	0	0	6.25	1
Diagnostic	2.22	4.54	1	0	0	0	0
Both	4.44	4.54	1	0	0	6.25	1
Syllabus-bound	2.22	0	0	14.29	1	0	0
Long-term	15.56	22.73	5	14.29	1	6.25	1
Both	11.11	9.09	2	14.29	1	12.50	2
Short-term	6.67	4.54	1	28.57	2	12.50	2
Communicative	13.33	13.64	3	14.29	1	12.50	2
Both	6.67	4.54	1	0	0	12.50	2
Individualistic	4.44	0	0	14.29	1	6.25	1

While PD group 1 ( $n = 17$ ) tended to display both a conceptual and a long-term mastery orientation, PD group 2 ( $n = 9$ ) showed more of a short-term orientation, followed by syllabus-bound, both short-term and long-term, communicative, and lastly, individualistic orientations. PD group 3 ( $n = 10$ ), in contrast, displayed all orientations with less emphasis on any particular orientation. In all of the PD groups, teachers showed contradictory orientations. Even when a teacher or some of them showed orientations that agree with the guiding principles of the PD program Mastering Math (see the green marked orientations), usually there was also at least one another teacher who revealed orientations that do not agree with the guiding principles (red marked), such as “(...) has mastered the task, even if the background knowledge may not change, but it is a success for them (...)” or who weighed the pros and cons of both contradictory orientations (orange marked) by referring, for example, to the need to take into account the different perspectives students and teachers have, such as “[...] the current material can’t be understood, if there are gaps before that are too big (...) for the short-term success of the children this is here [short-term] much better and for the motivation also, but [...] as a teacher I have them but then rather the longer-term development in view”.

Teachers’ statements that, in some cases, point to orientations contradictory to the PD guiding principles represent the starting point of the PD with which facilitators need to deal with when targeting the PD content goals. We examined the practices and patterns of practices facilitators showed in response to teachers’ orientations as a next step (RQ 2 and RQ 3). The analysis of the facilitator practices in reaction to the statements made by the teachers in the three PD groups revealed

a variety of practices in the three groups (RQ2). When analyzing facilitators' reactions and responses to orientations teachers articulated, the number of statements that agree, disagree or weigh pros and cons were considered (see table 2). Facilitators in PD group 1 most often needed to react to teachers' statements that were in agreement with PD guiding principles. Accordingly, the number of facilitator statements providing confirmation is the highest in that group. However, the facilitators did not provide confirmation to all of the agreeing statements, but instead took note of them, recognizable through verbalized acknowledging.

**Table 2: Absolute instances of facilitator practices in response to teacher statements in the PD groups**

Facilitator practice in reaction to a teacher statement that	Group 1 facilitators	Group 2 facilitators	Group 3 facilitators
is in agreement with PD guiding principles	(=14 statements)	(=2 statements)	(=5 statements)
• Acknowledging	4	2	2
• Providing confirmation	9	3	2
• Taking a neutral position	0	0	0
• Not commenting	0	1	0
• Invalidating a statement	0	0	0
weighs pros and cons of PD guiding principles	(=5 statements)	(=1 statement)	(=7 statements)
• Acknowledging	0	0	1
• Providing confirmation	3	1	1
• Taking a neutral position	0	0	1
• Invalidating a statement	2	0	1
• Reinterpreting a statement	1	0	0
is in disagreement with PD guiding principles	(=3 statements)	(=4 statements)	(=4 statements)
• Acknowledging	0	0	0
• Providing confirmation	1	1	0
• Taking a neutral position	0	0	0
• Invalidating a statement	2	3	1
• Reinterpreting a statement	1	2	0

If teachers' statements were in disagreement with the PD guiding principles or the teachers weighed pros and cons, the facilitators, in most cases, invalidated or reinterpreted teachers' statements, pursuing the content goal, but also provided confirmation when teachers weighed pros and cons, preferring to keep a good atmosphere as a situative goal. The facilitators' practice of providing confirmation, even when a teacher's statement did not agree with the PD principles, is part of a pattern

we identified also in PD group 3 (RQ3). Facilitators first showed esteem for participants by providing confirmation as a first step, presumably to maintain a good atmosphere. As a second step, they invalidated or reinterpreted the teacher's statement, to stick to the content goal, by referring to PD guiding principles when highlighting the important role of understanding:

Facilitator: "Absolutely. And exactly it always depends on the person. [...] In the short term I totally agree with you that you should build up self-confidence and strengthen the child a bit. But the understanding is [...] and according to the concept of being able to do math safely is really the absolute crux. [...] I can't understand the small, I can't understand the big – never. Ability. And then this child will always have failures his whole life long in mathematics lessons. [...] That we think about it that understanding is really the absolute basis."

In sum, the facilitators in PD group 1 used the chance to refer to PD guiding principles implicitly or explicitly eight times when responding to teachers' statements (see table 3) and additionally illustrated one of the principles by means of driving a car as an everyday example.

The facilitators in PD group 2 pursued another pattern to respond to teachers' statements. Only two teacher statements in this group were in agreement with PD guiding principles. The facilitators did not comment on the two statements directly but acknowledged the statement and returned to it later on to provide confirmation more than one time in order to pursue the content goal of the PD. Furthermore, when all teachers showed nonverbal agreement with the PD guiding principles, the facilitators did not ask them to provide an argument, resulting in a lower number of statements in agreement with the PD principles. Instead of asking teachers for arguments, the facilitator used the chance to praise the orientations of the teachers and additionally to refer to the PD guiding principles implicitly (see Table 3), using an alternative way to target the content goal. In the case of teacher statements in disagreement with PD guiding principles, the facilitators invalidated and/or reinterpreted the statement, and, in one case, they provided confirmation. Also, in regard to the one statement that weighed pros and cons, the facilitators provided confirmation of it. In these cases, facilitators pursued an atmospheric goal instead of the content goal.

The facilitators of PD group 3 responded to one of the five statements with the PD guiding principles, agreeing with teachers' orientations by providing confirmation two times, but missed responding to four of them. Instead of directly providing confirmation with PD principles to agreeing statements, the facilitators provided anecdotes from their private lives or from their own teaching experiences. The same occurred in response to disagreeing statements or statements that weighed pros and cons (in sum 7 times, see Table 3). The facilitators referred implicitly or explicitly to PD guiding principles in response to all kinds of statements in six cases. Both contributed to maintaining a good atmosphere in the PD course. In sum, very often, they referred to examples out of their private lives and own instruction, as well as to PD guiding principles, explicitly or implicitly, pursuing an atmospheric goal. Instead of responding to teachers' statements directly, they decided to let the discussion between teachers flow, looking for statements of other teachers that invalidated the disagreeing statement. Furthermore, they avoided direct responses that invalidated or reinterpreted teachers' statements, also contributing to a good atmosphere and, at the same time, preserving the PD content goal.

**Table 3: Absolute instances of facilitators reference to practice in the three PD groups**

Facilitators use of	Group 1	Group 2	Group 3
• anecdotes or everyday examples	1	0	2
• examples from own instruction	0	0	5
• explicit reference to the PD guiding principles	5	1	4
• implicit reference to the PD guiding principles	3	3	2

## Discussion and conclusion

The orientations teachers showed when they started a PD course on fostering the ability to monitor and enhance students' understanding of basic concepts are to some extent in line with previous evidence that points to a more procedural (Beswick, 2007; Wilhelm et al., 2017), syllabus bound, short-term (Prediger et al., 2016), and individual orientation (Krähenmann et al., 2019), instead of a conceptual, diagnostic, long-term and communicative orientation. The latter orientations build the principles of the PD program and inform the content goals facilitators need to target when conducting the PD. The study revealed various practices facilitators use to respond to teachers' various orientations. Facilitators in PD group 1 mostly invited teachers to make a statement or bring an argument to the discussion. In the light of the PD guiding principles, the facilitator succeeded in being a good role model in that he or she exemplified a communicative orientation. Facilitators in PD group 2, in contrast, let many chances pass to invite teachers into a discussion or to ask them to bring arguments for their orientation and therefore missed examining whether teachers actually have conceptual orientations or whether they hold procedural orientations. Facilitators in PD group 3 faced many disagreeing statements as well as statements that weighed pros and cons and they responded to these statements with various examples from their daily lives and their own teaching practices, combined with explicit or implicit references to PD guiding principles.

In regard to the typical facilitators' patterns we identified, first, in many cases, the facilitators avoided reinterpreting or invalidating teachers' statements directly, but started their responses by providing confirmation before invalidating or reinterpreting them, presumably in order to maintain a good atmosphere. An additional pattern was found, also probably aiming to maintain good atmosphere within the PD groups: Instead of responding directly to statements that were not fully in agreement with PD guiding principles, the facilitators in two of the groups often used anecdotes or examples of their own instruction or referred to PD principles. Recourse to examples and principles seems to help the facilitators to pursue the content goal with a simultaneous preservation of a good atmosphere.

The study reveals the variety of facilitator practices used to respond to teachers' orientations and contributes to the understanding of multiple ways and patterns that appear in facilitators' moderation strategies when conducting PD courses. In line with the results of further case studies (Prediger & Pöhler, 2019), the challenge facilitators face when navigating between different PD goals they need to manage becomes obvious; in our study, facilitators' practices in all three of the PD groups demonstrated how facilitators attempted to balance content goals and atmospheric goals. As a next step, we suggest the investigation of whether facilitators' abilities to focus more strongly on the



content goal while simultaneously considering atmospheric goals can be fostered by discussing PD incidents in video clubs and probing PD situations in simulated learning environments.

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