# The Fellowship of Practice: Facilitators' Roles and Obligations in Mathematics Teacher Professional Development

Soobin Jeon
*University of Michigan*

Amanda M. Brown
*University of Michigan*

Patricio G. Herbst
*University of Michigan*

Rüya Savuran
*Florida Atlantic University*

Received: September 2025 ǁ Accepted: July 2026
© 2026 Mathematics Education Research Group of Australasia, Inc.

The study reported in this article explored the hypothesis that mathematics teacher educators (MTEs) have professional obligations that constitute resources and constraints for managing practice-based professional development (PD). This was done by inspecting how 12 facilitators from varied institutional positions, who led a two-year implementation of Story*Circles*, reflected on their work of facilitation. Participants were interviewed using a protocol that made explicit the hypothesis proposed. Using caricature analysis inspired by *The Lord of the Rings*, where a fellowship of companions supports one individual in carrying the Ring, the researchers developed facilitator caricatures that capture different orientations that facilitators can take when supporting teachers' professional development. Findings reveal that all facilitators recognised disciplinary, interpersonal, individual, and institutional obligations as relevant to their work. The distinguishing feature was the choice of obligation each treated as the anchor in moments of uncertainty, reflecting the multiple sources of legitimacy for knowledge of mathematics teaching practice that facilitators may recognise when that practice becomes the content of PD. This study contributes to theorising the professional obligations that shape facilitation of practice-based mathematics PD and how facilitator identity is jointly constituted by systemic affordances and the personal resources individual facilitators bring to their role.

**Keywords** · mathematics teacher education research · facilitators · professional obligations · practice-based professional development · caricature analysis · teaching through problems

## Introduction

### *Facilitators' Roles and Responsibilities in Professional Development*

Facilitators play a central yet underexamined role in the professional development of mathematics teachers. Their contribution is often sourced from varied institutional affiliations—university-based mathematics teacher educators, teacher leaders, and consultants, which may shape how they approach facilitation (Perry & Booth, 2024). Acting simultaneously as colleagues and leaders, they may serve as critical friends, coaches, or mentors, supporting teachers' growth while honouring their professional expertise (Knapp, 2017; Margolis & Doring, 2012). Facilitation is thus a complex practice involving communication, relationship-building, and instructional design that extends far beyond knowledge transmission (Borko et al., 2014; Brown et al., in press). Yet facilitators' work is less regulated and less uniformly institutionalised than teaching, as many take it on part-time or alongside other roles, so considerable variability in how individuals inhabit the role is to be expected. Facilitators are also subject to program-level expectations: they are often asked to deliver standardised professional development (PD) with fidelity (Jacobs et al., 2017), while adapting to teachers' specific needs, such as addressing gaps in students' readiness or incorporating culturally relevant contexts (Karsenty, 2021; Maaß &

Doorman, 2013). As well, funding bodies, such as the National Science Foundation, often expect projects to transform existing teacher practice (NSF, 2017, 2023).

In this context, PD facilitators face responsibilities and expectations that differ in important ways from those of mathematics teachers, warranting inquiry into the obligations that shape how they enact their role. Prior literature describes facilitators as adaptive professionals fulfilling multiple functions, such as delivering training, mentoring teachers, designing learning environments, and supporting school-level change—while navigating tensions between program goals and teacher needs (Fransson et al., 2009; Schwarts et al., 2025). Researchers have characterised facilitators as "disciplined improvisers" who balance fidelity to structured programs with responsive adaptation, drawing on content expertise, orchestration skills, and community-building (Jacobs et al., 2017), and their effectiveness is closely tied to being perceived as both credible experts and supportive collaborators (Higgins & Parsons, 2011; Linder, 2011). Existing scholarship has begun to name facilitation practices such as treating participants as co-learners, mediating conflict, and steering toward content goals (Karsenty et al., 2023; Perry & Booth, 2024; Prediger et al., 2022). Facilitation thus requires navigating competing demands across multiple stakeholders, which, for the purposes of this study, we interpret as consequences of facilitators navigating professional obligations.

This article extends the conversation about facilitator roles by foregrounding a central hypothesis: facilitators navigate competing obligations as they lead practice-based mathematics PD. The hypothesis explicitly seeks to interpret and probe the proposition that stakeholders comparable to those to whom mathematics teachers are obligated (i.e., Knowledge, the Client, Society, and Organization; Chazan et al., 2016) also hold facilitators accountable. This is explored in the context of Story*Circles*, a model of practice-based PD where facilitators are expected to centre teachers' voices as they design a problem-based lesson. This design expectation distinguishes Story*Circles* from PD efforts that empower the facilitator to advocate for particular practices. Facilitators' navigation of Story*Circles'* expectations in consideration of their prior experiences has the potential to create a context in which their sense of professional obligation could become salient. By providing empirical insight into how facilitators from varied institutional positions may differ in the obligations they recognise and prioritise, this work complements existing accounts of effective facilitation by building theoretical understanding of the professional obligations shaping practice-based mathematics PD.

To understand potentially diverse stances, we draw on caricature analysis (Brown & Herbst, 2025; Lambdin & Preston, 1995), which captures composite orientations to facilitation without reducing them to simplistic binaries (e.g., expert vs. peer, leader vs. collaborator). Inspired by *The Lord of the Rings* (Tolkien, 1954a, 1954b, 1955), facilitators are framed as a fellowship accompanying Frodo—representing each and every teacher—on the arduous journey of carrying the Ring. In Tolkien's narrative, the Ring represents power: the desire to dominate, the certainty that control wielded by someone wise and well-intentioned could finally do good. Following Tolkien's resistance to fixing the Ring to a single meaning—distinguishing allegory, which imposes the author's meaning, from applicability, the reader's freedom to find the story resonant—we read the Ring as what teachers in practice-based PD are asked to carry: the demanding, irreducibly personal work of transforming their practice, which no one else can undertake on their behalf. Just as Tolkien's fellowship embodied diverse stances and strengths, no one able to substitute for what Frodo alone must do, our caricatures illustrate the varied ways facilitators orient toward teachers' practice and their own professional obligations, making visible the range of stances the participants' reflections reveal.

## Theoretical Perspective and Framework

### *Professional Obligations*

The research undertaken was grounded in practical rationality (Herbst & Chazan, 2011), which conceptualises mathematics teaching practice as shaped not only by individual resources such as skills or beliefs but also by the norms of instructional practice and the professional obligations of the position

of mathematics teacher. These obligations serve as sources of justification for actions, especially those that deviate from instructional norms, binding practitioners to the stakeholders of an instructional system represented by the instructional triangle (Cohen et al., 2003). Chazan et al. (2016) identified Knowledge, the Client, Society, and Organisation as the stakeholders of the four professional obligations of mathematics teaching. These obligations concern, respectively, the discipline of mathematics (disciplinary), students as individuals (individual), societal values and school needs (interpersonal), and the institutions of schooling (institutional).

Though developed for mathematics teaching, Herbst et al.'s (2023) extension to instructors of prospective teachers suggested the four obligations' stakeholders can be reinterpreted for teacher developers. In mathematics courses for teachers, for example, the Knowledge stakeholder might encompass not only the discipline of mathematics but also mathematics education research as a source of knowledge about student conceptions. This raises a question for the present study: "How do facilitators of practice-based PD recognise and navigate professional obligations when supporting teachers' learning?" This study examines empirically whether and how the four obligations apply to facilitators, and the stakeholders to whom those obligations are directed. In mathematics teaching, obligations illuminate the sources of instructional norms and how teaching actions may be justified even when those norms are breached. PD practice has been similarly represented through a PD triangle (Prediger et al., 2019), raising the possibility that norms and obligations play analogous roles. Carroll and Mumme (2007) proposed a recursive version of Cohen et al.'s (2003) instructional triangle to represent facilitators' work in practice-based PD (Figure 1). Like the instructional triangle, it has three vertices: the facilitator (mathematics teacher educator) and PD participants (mathematics teachers) occupy positions analogous to teacher and student, while the third vertex holds the practice of teaching mathematics. This makes practice-based PD a distinctive activity and renders practice researchable (Ghousseini & Sleep, 2011). Story*Circles* instantiate this model by engaging practitioners' tacit knowledge of practice as they collaboratively build and represent a problem-based lesson through a storyboard.

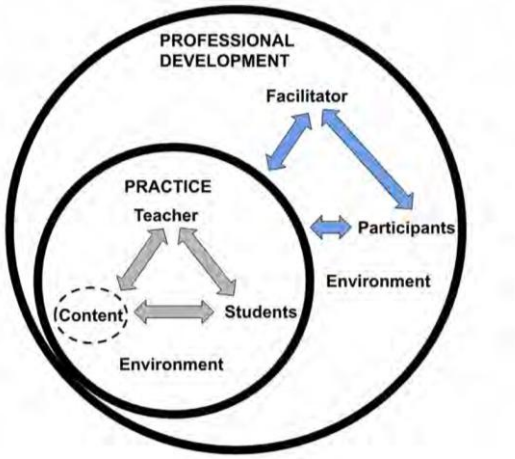



*Figure 1.* The PD Triangle (adapted from Carroll & Mumme, 2007, p. 11).

Practical rationality also helps unpack the content vertex of the PD triangle: facilitators navigate an exchange between two manifestations of teaching practice—general ideas about teaching through problems (e.g., noticing student work serviceable for advancing toward a lesson goal) and the specific moves participants anticipate as they design a particular lesson. As in the preparation of prospective teachers (Chazan & Herbst, 2023; Herbst & Chazan, 2023), facilitators manage PD content by attending to the exchange between participants' lesson design on a storyboard and their developing competency in teaching through problems, making judgments about what aspects of practice to foreground as

designs are revised. It was expected that managing this exchange within Story*Circles* could surface tensions with how facilitators had managed similar exchanges elsewhere, making their professional obligations visible.

What makes this exchange genuinely difficult for teachers is clarified by a distinction Sfard (1998) draws in mathematics learning. She identified two organising metaphors: the *acquisition* metaphor, under which learning is gaining a commodity to be possessed and mastered, and the *participation* metaphor, under which learning is ongoing engagement with a practice, a way of being in the work rather than reaching a destination. Though developed for students learning mathematics, the participation metaphor is central to the logic of problem-based learning, which holds that mathematical understanding emerges through sustained engagement with problems rather than transmission of finished knowledge. Practice-based PD extends this commitment to the learning of teaching. Rather than transmitting techniques or models of best practice, it asks teachers to develop their practice by doing it, arguing about it, and revising it alongside colleagues. Story*Circles* are built on this premise, placing lesson design in teachers' hands not as a pedagogical preference but as a theoretical commitment to participation as the condition under which teaching practice can genuinely develop. The tension between acquisition and participation that Sfard (1998) named in mathematics learning is thus structurally reproduced at the level of professional learning. Potentially, teachers who treat teaching through problems as a set of moves to be mastered relate differently to Story*Circles* and to their students than those who inhabit teaching through problems as ongoing practice. This matters for facilitation because the acquisition orientation carries a specific risk: that growth converts participation into dominion. The teacher who has developed facility with teaching through problems is precisely the one most tempted to use it to control rather than open the mathematical space to become the authority rather than the practitioner. Sfard's participation metaphor insists that expertise in teaching, like expertise in mathematics, is never a destination but an ongoing act of carrying the work. Facilitators must therefore sustain the conditions for that carrying rather than relieve teachers of the burden, especially when they could carry it more efficiently themselves.

This commitment to participation shapes the demands of facilitation of Story*Circles*. Because facilitators came from varied prior positions, they were expected to handle PD practice differently. Facilitators often carry implicit expectations from prior roles, such as interpreting student ideas on behalf of others, that Story*Circles'* design can disrupt through shared representations, distributed authority, and collaborative interpretation (Schwarts et al., 2022). Such moments of uncertainty offer a productive lens for theorising how facilitators interpret and navigate their obligations in practice-based PD.

This framing guided the following research questions:

1. *How do facilitators recognise and take up the shared professional obligations of facilitating practice-based professional development, and how do caricature analyses make visible the diverse ways facilitators orient themselves in relation to these obligations?*
2. *In what ways do facilitators' varied stances shaped by prior experiences and sources of justification contribute to a collective fellowship of practice that supports teachers' learning of problem-based instruction in Story*Circles*?*

# Methods

## *Context and Participants*

This study examines how mathematics teacher educators take up the professional obligations of facilitation in practice-based, lesson-centered PD like Story*Circles*. In Story*Circles* (Herbst & Milewski, 2018), secondary mathematics teachers collaboratively design problem-based lessons by scripting, visualising, and arguing about instructional interactions through discussions managed by a facilitator in response to realistic classroom contingencies (Brown & Herbst, 2023). Working with structured

resources—a novel task, a lesson goal, and a starter storyboard—teachers translate pedagogical ideas into visual representations, rehearse ambitious teaching strategies, and engage in peer-supported instructional decision-making.

The facilitator's role in Story*Circles* is both distinctive and demanding. Facilitators are not participants in the lesson-design conversation; they create and sustain the conditions under which teachers learn from one another as they design the lesson. They hold authority over the process without exercising authority over the content by managing participation, leveraging productive disagreements, and resisting steering teachers toward particular pedagogical stances.

Twelve facilitators participated in a two-year implementation of Story*Circles*, located in five countries: Bulgaria, India, the Philippines, South Africa, and the United States. Their institutional positions were diverse: university faculty in mathematics education ($n$ = 6; Ebo, Flora, Jaroslav, Lucy, Qanna, River) or mathematics ($n$ = 2; Rachel, Zane), mathematics consultants at local or regional school districts ($n$ = 2; Ike, Jennifer), a curriculum coordinator in a district ($n$ = 1; Iris), and a mathematics department chair at a high school ($n$ = 1; Charlotte). Collectively, facilitators averaged 17 years of professional experience in mathematics education (range 6–28 years), with seven having taught mathematics for an average of 14 years. Nine facilitators had both led and participated in mathematics PD in the two years preceding Story*Circles*; two had only been involved as participants. One facilitator departed after the first year, and a new facilitator joined in the second year. Story*Circles* was new to all facilitators but one. All participants are referred to by pseudonyms.

## *Data Collection*

The primary data are semi-structured interviews (Creswell & Poth, 2016) with all 12 facilitators, conducted at the conclusion of the two-year Story*Circles* implementation in June 2025. Using a protocol (see Appendix A) that made explicit the hypothesis that mathematics teacher educators have professional obligations that resource and constrain the management of practice-based PD, facilitators were invited to reflect on and respond to the protocol directly, surfacing how they navigated professional obligations and reasoned about their responsibilities.

Eleven of the twelve facilitators had discussed the four professional obligations of mathematics teaching (Herbst & Chazan, 2011) during the first year of Story*Circles*, enabling them to compare how obligations bear on teachers with how the obligations bear on themselves as facilitators. The facilitator who had not participated in the discussions the previous year received an introduction to the four obligations at the interview's outset to ensure a shared basis for comparison.

Interview prompts addressed: (1) how facilitators perceived their professional obligations in relation to those of teachers, and (2) moments of uncertainty regarding how to respond and the resources they mobilised to guide their responses. These prompts aimed to surface both facilitators' explicit reasoning and the underlying sources of obligation shaping their facilitation, including how institutional positions and prior experiences informed how they took up the work.

## *Analytic Approach*

The analysis combined caricature analysis (Lambdin & Preston, 1995; Milewski et al., 2017) with thematic analysis (Braun & Clarke, 2006) across three phases. First, following each interview, a structured memo summarised how each facilitator described their obligations relative to those of the teachers, the tensions they named in moments of uncertainty, and the knowledge sources they mobilised. These memos served as both initial thematic coding and a record of each facilitator's orientation, independently reviewed by two authors to identify tensions named and obligations prioritised. Second, a cross-case memo identified recurring and contrastive patterns across the 12 facilitators, focusing on which obligation each foregrounded most consistently, how they responded when obligations came into tension, and what sources of justification were mobilised. The cross-case memos were then analysed inductively to generate themes, identifying recurring sources of justification (mathematics content, mathematics education research, teaching experience, institutional expectations)

and moments of uncertainty where obligations conflicted. Third, caricatures emerged from these patterns through iterative discussion among the authors, with disagreements leading to refinements in how caricature boundaries were characterised.

When orientations were identified thematically from the structured memos, *The Lord of the Rings* (LOTR) fellowship was used as a representational device. Characters were selected because their defining stances corresponded to facilitator orientations present in the data, with the number of caricatures determined by the analysis rather than the analogy. Caricatures were then enriched with thematic patterns and illustrative examples, linking facilitators' stances to their epistemic resources and justifications for action.

Caricatures emphasise distinctive features of facilitators' stances, not as literal representations but as sharpened, narrative-informed portraits that communicate variation in orientations to professional obligations (Worth, 1974). The use of caricatures also reflected ethical considerations. With 12 facilitators, the interest was in the orientations their varied stances make visible, which related to the roles facilitators take up rather than the individuals themselves. Caricatures foreground salient features of each orientation, particularly in moments of uncertainty, without making individuals identifiable or scrutinised, honouring the trust participants extended in sharing their reflections (Brown & Herbst, 2025).

The use of literary narrative as an analytic device belongs to a broader tradition that takes story seriously as a way of knowing. Bruner (1986) argued that the mind operates through two irreducible modes: the *paradigmatic*, which develops empirically verifiable propositions, and the *narrative*, which makes sense of human experience through story. Both operate in our analysis. The framework of professional obligations lets us reason paradigmatically by identifying the structural demands that bind facilitators to multiple stakeholders, while the caricatures let us engage narratively, entering imaginatively into the experience of navigating those demands as a facilitator might feel them.

Scholars in teacher education have drawn on Campbell's (1949) archetypal hero's journey to understand the struggles and transformations of learning to teach, finding in narrative what theoretical constructs can name but not always make felt (Goldstein, 2005; Randles, 2012). Goldstein's (2005) use of *Star Wars* in preservice teacher education is instructive: like Tolkien's fellowship, Lucas's galaxy offered widely accessible story structures rooted in ancient mythic patterns, letting individuals see their professional experiences from a new perspective.

Tolkien's LOTR centres on Frodo Baggins, an ordinary hobbit, constitutionally unsuited to heroism and uninterested in power, who comes to carry the most dangerous object in Middle Earth. The Ring is not simply a weapon; it is the concentrated will of an evil intelligence, forged to dominate all other wielders of power. Whoever carries the Ring is subject to its corrupting pull; whoever uses it, even for good, risks becoming its servant. The only solution is to carry it to the place of its making and destroy it, a journey of near-impossible difficulty across hostile terrain, with the Ring working against its bearer at every step. Frodo does not go alone. He is accompanied by the Fellowship: nine companions drawn from the free peoples of Middle Earth, diverse in background and unequal in power, not all remaining together for the whole quest. A shared purpose unites them to support the Ring-bearer in carrying what none of them can carry for him, each bringing a distinct stance to that shared work.

At its most fundamental level, the Ring represents power—the desire to dominate, to control, to know best. This resonates with the *acquisition* metaphor Sfard (1998) describes and with the Ring's particular temptation: the seductive conviction that expertise, wielded by someone wise and well-intentioned, could finally do good. Yet Tolkien (2012, "Foreword to the Second Edition") insisted the Ring not be fixed to any single meaning, distinguishing allegory—which imposes the author's meaning—from applicability, the freedom of readers to find the story resonant with their own experience. The goal is to follow Tolkien's lead, offering a reading of the Ring's applicability to Story*Circles* that is developed further through the findings.

What makes the quest structurally distinctive—and analytically useful—is that the Ring cannot be carried by anyone else. The most powerful beings in Middle Earth refuse it precisely because their power would worsen the corruption. The fellowship does not carry the Ring; they protect the

conditions under which Frodo can keep going, while the work remains irreducibly his own. Analogously, teaching mathematics through problems—attending to student thinking, resisting the pull toward telling, holding open the space for productive struggle—cannot be carried by anyone other than the teacher. Facilitators who take over, redirect, or supply answers do not help the bearer but relieve them of the very work that constitutes the journey. The fellowship metaphor insists that the most important thing facilitators can do is sustain the conditions under which teachers can keep carrying what only they can carry.

The choice of LOTR over other narrative frameworks was deliberate: mythological characters often carry too much culturally specific associations, while many narratives centre on a solitary hero rather than a group with a shared purpose. The fellowship's many members, each bringing a distinct stance to shared work, richly represent the range of facilitator orientations we observed, and the narrative's international familiarity suited the diverse institutional and cultural contexts of this study. The authors acknowledge that LOTR has been critiqued for its limited female representation and implicit religious undertones (Wood, 2003); the use of the Tolkien trilogy is not meant to import these entailments but to draw on the fellowship's collective journey in support of Frodo as a metaphor for how facilitators support mathematics teachers and navigate the professional obligations of that role.

The aim of the research lies in grounding an hypothesis about facilitator obligations generally, rather than treating the differences observed among the 12 facilitators as idiosyncratic. By identifying the common professional obligations Story*Circles* facilitators attend to, the LOTR caricatures highlight the different ways those obligations are enacted, illuminating understanding of orientations in relation to each other rather than in isolation.

# Findings

## *Professional Obligations of Facilitation in Story*Circles

Despite their varied institutional roles and professional histories, all facilitators oriented to a shared set of professional obligations made apparent through managing Story*Circles*. It was hypothesised that the facilitation expectations prescribed by the Story*Circles*' design—that facilitators would orient participants to one another as sources of knowledge and refrain from advocating for decisions—were challenging to meet, and that professional obligations provided resources for justifying departures from these expectations. The obligations surfaced as recurring themes in how facilitators justified their actions and navigated moments of uncertainty.

### *Disciplinary obligations*

There was evidence that facilitators recognised an obligation to knowledge, as all described responsibility for the validity of the knowledge they stewarded. For some facilitators ($n = 4$), this meant pressing for precision, sequencing tasks with logical coherence, or recognising multiple solution paths. Others ($n = 3$) broadened what counts as relevant knowledge, incorporating pedagogy and teacher expertise into the disciplinary frame. One facilitator noted, "I feel like my objectives are more tied to a more explicit teaching goal, which is to kind of support teachers to better pay attention to and make sense of student thinking," whereas in "a K–12 math class, I have this objective that I want the kids to learn the midpoint of the hypotenuse theorem today." A few facilitators ($n = 3$) articulated a dual-disciplinary stance, distinguishing knowledge of mathematics as a discipline from knowledge of mathematics education research.

### *Interpersonal obligations*

There was evidence that facilitators recognised an obligation to social values and norms. All facilitators spoke about protecting relationships and sustaining collegial trust, describing safe spaces for risk-taking ($n = 6$). Monitoring dynamics of dominance and silence ($n = 3$), and attending to cultural or linguistic sensitivities ($n = 2$) were less prominent in the data. There was consistent emphasis on preserving teachers' dignity particularly when concerns arose about individuals' mathematical

understanding. One facilitator recalled, "Biting my lip" rather than risk causing another participant embarrassment in front of colleagues.

*Individual obligations*

There was evidence that facilitators recognised an obligation to individual participants. Many facilitators ($n$ = 7) described responsibility for individual teacher's growth and confidence, sometimes withholding mathematical correction to protect agency or redirecting discussion to ensure all teachers had an entry point into the discussion. Several described consciously investing in teachers' personal and professional identities, supporting them as people as well as practitioners.

*Institutional obligations*

Evidence of an obligation to organisation was more uneven but still present. Several facilitators referenced school-level constraints such as pacing guides, rigid timetables, or policy demands ($n$ = 4); others named fidelity to Story*Circles* design protocols or lesson goals as a form of institutional accountability ($n$ = 3); still others noted the relative absence of institutional pressure in Story*Circles* compared to their usual work contexts ($n$ = 2). These shared obligations suggested facilitators did not merely enact personal preferences but recognised professional obligations pulling them in multiple directions. Differences were nonetheless visible in how they prioritised these obligations in moments of uncertainty, which were described using the notion of facilitator orientation.

## *How Obligations Surface as Tensions in Facilitation*

Facilitators' accounts revealed recurring tensions best understood through the PD triangle (Figure 1), particularly in how they navigated their role in relation to teachers and the practice of teaching. Their actions illustrated how facilitators weighed competing obligations while seeking to support teachers without overtaking other facilitators' work.

*Correcting vs. protecting teacher agency*

Facilitators felt responsible for safeguarding mathematical and pedagogical integrity while also protecting teachers' voices. The disciplinary obligation surfaced most acutely when errors or misconceptions appeared. Several described moments when they "knew [teachers] were saying the wrong thing" but refrained from direct correction, letting participants self-correct to preserve agency and avoid embarrassment. Ebo explained that his university background sometimes prompted him to ask, "Have you thought about [this definition or function]?" adding that he had "that luxury, whereas for [teachers,] it's about the shortness of [time for] decision-making in classrooms." The tension laid in discerning when correction would advance learning and when it might silence teacher voices.

*Pressing forward vs. trusting participants*

Another tension emerged concerning how far facilitators should advance a lesson's mathematical goals. Facilitators often held back their views to sustain group trust, deferring to teachers' contributions even when imperfect and managing participation so all felt safe to speak. The interpersonal obligation was central because teachers' collective design work depended on their willingness to remain vulnerable, making trust a precondition for progress.

*Supporting teacher agency vs. responding to institutional constraints*

Facilitators also balanced teachers' growth with institutional realities, including curriculum pacing guides, testing schedules, and policy mandates. Many worked to ensure every participant's perspective was represented in the envisioned lesson, resisting outcomes that reflected only the most confident voices and redirecting discussion, so the lesson remained both feasible and collectively owned.

## *Facilitator Caricatures: Supporting Frodo*

Caricatures are used to make facilitator orientation explicit, rendering differences in orientation visible and amenable to analysis despite their holistic nature. In this framing, Frodo represents the teacher on

the journey of teaching mathematics through problems, a practice that surfaces persistent pulls in multiple directions toward well-worn routines, procedures over reasoning, and efficiency over student voice. These pulls do not simply disappear because a teacher recognises them; teaching through problems remains demanding even for teachers who understand its value and are actively working toward it. Like Tolkien's Ring, which tests each bearer differently according to what they most desire, the work of teaching mathematics through problems surfaces different tensions and temptations. The Ring, in this reading, is not any single one of these pulls but what happens when any legitimate good—expertise, mathematical rigor, relational trust, institutional accountability—is pursued as the highest good, devoid of competing considerations that would otherwise hold it in check. In Story*Circles*, these tensions are deliberately centred. Teachers collectively anticipate and design problem-based lessons that expose and press against these pulls, while the fellowship—the facilitators—sustain the conditions under which teachers can keep carrying what only they can carry.

What makes the Ring's burden specifically dangerous—and what connects Tolkien's narrative to Sfard's (1998) distinction between acquisition and participation—is that its corrupting effects fall not on those who fail to carry it, but on those who carry it longest and most successfully. The teacher who has struggled with teaching through problems and arrived at something hard-won is precisely the one most vulnerable to the Ring's temptation: to transform participation into dominion. To move from *I am learning this* to *I know this* to *I know better than my students (and colleagues) how this should go*. To use expertise not to open the mathematical space but to control it, to become the authority rather than the practitioner. The Ring's corruption is not ignorance; it is forgetting what not-knowing felt like and using that forgetting as authority. This is why the Ring must be destroyed: not because expertise is inherently problematic, but because an acquisitive relationship to expertise—the belief that one has arrived and that becoming is complete—can corrupt the mission the teacher is meant to serve. In Sfard's terms, destroying the Ring is the moment a teacher releases the acquisition metaphor as a goal entirely and enters the participation metaphor as a way of being, no longer carrying expertise as a destination but practicing it as an ongoing act. This is not a permanent achievement. The Ring reappears whenever a teacher encounters a new challenge where the pull toward telling, resolving, and using what one knows to control what happens next is strongest. The fellowship's deepest work is sustaining the conditions under which teachers can keep choosing participation over acquisition, especially when they are skilled enough to choose otherwise.

This article presents six caricatures drawn from characters in Tolkien's *The Lord of the Rings*—Samwise, Merry, Aragorn, Legolas, Gimli, and Galadriel[1]—each bringing distinct strengths, knowledge, and orientations to the shared work, yet none are able to substitute for what Frodo alone must do. Crucially, each has carried something of their own—their hard-won knowledge or their encounters with the temptation to take over or claim expertise earned. They walk alongside Frodo not as strangers to the Ring's logic but as former bearers who understand it from the inside and have chosen, often at great cost, to resist it. The facilitators in this study are similar: they came to Story*Circles* as experienced practitioners who had once been Frodo themselves, having carried out the demanding work of transforming their own teaching practice. The expertise they developed through this process now makes them vulnerable to the Ring's temptation. Each caricature emerges from that backstory—from a prior journey that shaped what each facilitator most desires, most fears, and most struggles to relinquish. These caricatures are composites, not portraits of individuals, and individual facilitators may recognise elements of more than one in their practice.

### *Samwise: The loyal companion*

Some facilitators foregrounded interpersonal and individual obligations above all others, describing their primary responsibility as sustaining teachers' dignity, encouraging participation, and protecting morale even when mathematical precision wavered. This orientation parallels Sam, whose loyalty

[1] Galadriel is not formally part of Tolkien's Fellowship, but her wisdom and guidance strengthened the journey and showed how both her support and restraint helped sustain Frodo's quest.

sustains Frodo through the most difficult stretches of the journey—respecting his decisions and offering steady encouragement rather than undermining his resolve. Ike captured this stance directly: "They have to be emotionally comfortable so they can be intellectually uncomfortable." Flora framed her obligation as managing collective work rather than imposing her own judgment: "Regardless of how I felt about a particular lesson … my task was to manage the flow of discussions." River underscored that "the interpersonal obligation is very strong, because if I want people to have respectful conversations; that's a big part of the facilitation process."

The central challenge was knowing when protection of dignity became a barrier to disciplinary engagement. Ike noted, "Teachers have an identity as a person, as a mathematician, [and] as a teacher, and all three … interplay very complexly," explaining why correcting others felt high-stakes. Flora recalled discomfort when content receded: "You have to navigate that … this is not all about getting students engaged. There's content that you have to teach." River described uncertainty when discussion stalled: "That was hard to facilitate, because you're not sure how to move the conversation forward if there's only one person, and there's nobody to push back." The tension was not whether to prioritise the relationship, but how long that prioritisation could hold before the mathematical work required a different move.

These facilitators drew on professional backgrounds in mentoring, trust-building, and patient guidance, positioning listening and eliciting as primary facilitation tools. In Story*Circles*, this orientation creates the psychological safety that makes teachers willing to take risks with an unfamiliar and demanding practice. The risk is that relational priorities may allow mathematical imprecision to go unchallenged longer than is pedagogically productive. A major challenge of this orientation is recognising when holding back has become habit rather than deliberate choice.

*Merry: The steadfast learner*

Some facilitators framed their role as learning alongside teachers while remaining accountable to the structures and goals of the PD. Seeing themselves as co-learners, they deferred to teachers' voices yet stepped forward when fidelity to Story*Circles*' design was at stake. This parallels Merry, who grows gradually into courage, rooted in love of his home, the Shire, but coming to recognise through peril and sacrifice that "there are things deeper and higher" (Tolkien, 2012, Book 5, Chapter 8, "The Houses of Healing") that call on him. Charlotte captured this dual orientation: "I don't really see myself as a teacher. I'm a continual student … I get to learn from [teachers] … I have an obligation to make sure that they meet the goals they've set." Zane extended the frame outward: "At the very core of it, it's about how do we, as [a] math education body, make the next generation [into] productive members of society," grounding institutional accountability in broader educational purpose.

The central tension was deciding when to contribute and when to hold back, sharpened by the risk of slipping from facilitator into fellow participant. Charlotte named this directly: "That was the biggest [challenge]—just trying to be the teacher in the group versus the facilitator of the group." Zane navigated this when participants sought validation: "Are we correct?" they would ask, and he would redirect—"Well, I can't tell you that. [You]'re the ones that decide whether you're right or not"—preserving teacher ownership while honouring his institutional responsibility to the integrity of the work.

These facilitators drew on leadership roles such as department chair and university professor, that taught them to listen before intervening, alongside classroom experience that kept them connected to teachers' practical realities. In Story*Circles*, this orientation sustains the collaborative, non-hierarchical norms the PD depends on, modelling what it looks like to be a learner rather than presenting as an authority. The challenge is that co-learner positioning can make it difficult to redirect the group when the work genuinely needs steering. The Merry facilitators' ongoing tension lays in holding the line between accompaniment and accountability.

*Aragorn: The leader and protector*

Some facilitators coupled strong disciplinary commitments with attention to institutional feasibility, resisting authority under ordinary circumstances but intervening decisively when the work risked

losing rigor or becoming disconnected from what teachers could realistically enact. This resembles Aragorn, who's most defining quality is not that he leads but that he knows when not to lead. For most of the quest he conceals his lineage, moving among the Fellowship as a ranger and guide rather than as a king, understanding that authority claimed too early corrupts the mission it is meant to serve. When Aragorn does step forward, it is because the moment demands it. His hardest decision comes when the Fellowship is broken through betrayal by one of its members, and Aragorn must choose whether to follow Frodo toward Mount Doom or pursue the orcs who have taken others of the Fellowship. He chooses the latter, saying, "[Frodo] is the bearer, and the fate of the burden is on him. I do not think it is our part to drive him one way or the other" (Tolkien, 2012, Book 2, Chapter 10, "The Breaking of the Fellowship"). He intervened decisively in one direction to protect Frodo's agency in another. That calculus—knowing which intervention serves the mission, and which would undermine it—is what facilitators in this caricature are navigating.

Iris named the dual charge plainly: "Maintaining the institutional focus of the goal while trying to delicately be a member of the group but [also] be the facilitator … that's my biggest challenge." Jennifer grounded it in classroom reality: "Anytime we try to work with teachers, we need to respect the fact that time is enemy number one … We want to learn and grow, but we often just need to get the job done." Protecting problem-based instruction meant keeping it both rigorous and survivable in teachers' actual contexts—a judgment requiring simultaneous attention to long horizons and ground-level constraints.

The central tension lay in calibrating when to intervene. Iris described the pull toward restraint: "I just want to give them a little nudge … but I can't, because I want my teachers to own their 'Aha moment'," adding that "knowing when to be quiet is the biggest challenge … and how long do you let them wrestle before you table it?" Jennifer faced a similar dilemma, wanting to protect ambitious pedagogy while acknowledging that institutional constraints push teachers toward quicker solutions. The cost of intervening too early or too late was felt in both the lesson's quality and teachers' ownership of it.

These facilitators' professional trajectories—rooted in consulting and coordinating roles close to classroom realities—gave them practical knowledge of school constraints, teacher workload, and what ambitious instruction requires to survive institutional pressure. In Story*Circles*, this orientation ensures the work produced is not only rigorous but usable. The risk is that a strong orientation toward feasibility may gradually narrow ambition. A major challenge of this orientation mirrors Aragorn's: knowing when holding back is wisdom and when it has become avoidance—and finding the courage to act when the moment demands it.

*Legolas: The devoted ally*

Some facilitators came to Story*Circles* primarily from the world of mathematics—bringing disciplinary perception and precision that few of their fellow facilitators could match yet choosing to place that expertise entirely in service of teachers' work. This resonates with Legolas, whose perception far exceeds his companions', yet who places those gifts entirely in service of the shared journey. While the fellowship deliberates over which path to take, Legolas perceives a threat in the darkness before anyone else has sensed it—making visible what others cannot see, then stepping back and leaving the fellowship to decide what to do with that knowledge. Rachel captured this positioning: "I put my brain a lot on the discipline area … That's not where my participants [are focused]," reflecting that "I'm thinking a lot about the participants as mathematics doers." Often from mathematics departments, these facilitators found that their expertise gained relevance for teaching when coupled with commitment to supporting participants.

A recurring tension was distinguishing whether teachers' contributions reflected mathematical misunderstanding or different priorities—and knowing how far to push when the difference was unclear. Rachel reflected: "It's unclear to me whether they were desiring [a sequencing of solutions] for math's sake … or for the individual's sake." Voicing a deeper uncertainty she said, "I don't know if you and I share the same mathematical understanding about what's happening." These moments exposed a gap between the facilitator's disciplinary vantage point and participants' ground-level concerns,

requiring continual navigation between maintaining mathematical standards and ensuring teachers feel supported rather than evaluated.

These facilitators brought strong content expertise enriched by teaching and facilitation experience that had taught them to adapt their disciplinary lens for adult learners. In Story*Circles*, this orientation safeguards mathematical integrity in ways other orientations may not consistently prioritise. The challenge is ensuring that disciplinary attentiveness translates into support teachers can receive rather than expertise that creates distance—a challenge these facilitators navigated by enacting their obligation through closeness rather than authority, sharing the work with teachers while holding mathematics at the centre.

### *Gimli: The guardian of fairness*

Some facilitators were oriented less by loyalty to a single discipline or institution than by a commitment to fairness—ensuring no voice dominated and that teacher-generated expertise circulated across the group rather than flowing from the facilitator's authority. In Tolkien's (2012) narrative, Gimli is summoned to the Fellowship precisely so that the burden does not fall disproportionately on any one people, his presence helping ensure that past failures rooted in division are not repeated. Lucy articulated this orientation:

> I have a disciplinary obligation in Story*Circles*… there is a content that I'm trying to get across. But again, that content is so different from teaching students because it's mostly pedagogical … it's kind of bringing together [the] expertise of different teachers and having them … re-disseminate it to each other … I don't have a particular content agenda in mind in the same way that I would if I were teaching.

For the facilitators, PD content emerged from group interaction rather than the facilitator's knowledge, and their role was to ensure no voice was lost along the way.

A central tension arose when facilitators lacked confidence in the mathematical details of a discussion. Lucy recalled scrambling to follow a teacher's reasoning, later reflecting she could have done more to elicit alternative perspectives: "How long should I let this go or pursue this when I don't think that it's particularly relevant to the task at hand?" The tension was not only about managing participation but about how to position their mathematical engagement in order to better support teachers.

The facilitators drew on teaching and facilitation experience across K–12 and undergraduate levels, giving them familiarity with timing dilemmas and the challenge of balancing voices in diverse groups. In Story*Circles*, this orientation is particularly attentive to whose voices count. Yet facilitators noted wishing for greater latitude to ask specific questions to deepen mathematical discussion, underscoring how their approach to rigor was mediated by interpersonal responsibility.

### *Galadriel: The wise guide*

Some facilitators described themselves as stewards of the work—carrying disciplinary expertise but deliberately resisting the urge to take over. They acknowledged they could correct or direct the work more quickly, but prioritised restraint to preserve teachers' ownership. This echoes Galadriel, who refuses the Ring even when Frodo offers it. Her reasoning is grounded in the ethics of care: "Would not that have been a noble deed to set to the credit of his Ring, if I had taken it by force or fear from my guest?" (Tolkien, 2012, Book 2, Chapter 7, "The Mirror of Galadriel"). She understands that taking the Ring, even with the best intentions, would betray the trust that makes her guidance possible and corrupt the mission it was meant to serve. Qanna framed this as a disciplinary obligation: "One very deep disciplinary obligation I felt was to make them realise that this is also math … These responses… have the potential to develop mathematical understanding in the classroom." Ebo described it from the inside: "I knew they were saying the wrong thing… [but] I [would] bite my lip. I had to say to myself, well, maybe another opportunity will arise." Jaroslav anchored it in the work of teaching: "The presenting of the content is actually one of the main tasks for every teacher in the classroom"—what facilitators must ultimately ensure teachers are prepared to carry.

A central tension arose when participants looked to facilitators for confirmation rather than generating their own answers. Qanna described crafting interventions to "say something in a manner in which they are able to express their views and are pushed to think and reason a little bit more." Ebo navigated this by redirecting rather than correcting: "The least I can say is to say, 'That's wrong,' which I didn't do … I said, 'Do you think the same as what [another teacher] just wrote?'" The challenge was finding moves that held mathematical integrity without undermining teacher thinking, in moments when participants were actively seeking authority.

These facilitators drew on trajectories as university educators in mathematics or mathematics education, combining academic knowledge with experience working with pre-service and in-service teachers, prior classroom teaching, and contextual expertise about local school norms. In Story*Circles*, this orientation offers sustained disciplinary stewardship—holding mathematics at the centre while systematically refusing to let expertise foreclose teacher thinking. The challenge is ensuring that this commitment to non-interference reads as guiding rather than withholding, particularly for teachers seeking more explicit support.

## Discussion: Fellowship of Practice

One of the most famous lines in *The Lord of the Rings* is Samwise's reminder to Frodo, "I can't carry [the Ring] for you, but I can carry you" (Tolkien, 2012, Book 6, Chapter 3, "Mount Doom"). This moment captures the essence of how facilitator support works: the journey remains the teacher's own, but companions can sustain, redirect, or steady them when its demands become overwhelming.

In Story*Circles*, where the goal is to design a problem-based lesson in which a problem leads students to new knowledge, teachers might easily default to more familiar patterns such as explaining new knowledge before applying it. The burden of doing things differently is deliberately placed at the center of PD. Problem-based instruction elicits more of the complexity of mathematics teaching practice, and that is what participants are asked to carry. Facilitators, like Tolkien's fellowship, are not expected to take up the Ring themselves. They walk alongside, offering wisdom, encouragement, or reminders of what is at stake.

In response to the first research question—how facilitators recognise and take up professional obligations—the findings illustrated that all twelve facilitators recognised disciplinary, interpersonal, individual, and institutional obligations as relevant to their work, even as they differed in how they prioritised and enacted them. What counted as valid knowledge varied, ranging from mathematical precision to pedagogical and experiential knowledge of teaching through problems. The threshold at which relational priorities gave way to disciplinary ones differed considerably. Recognition of institutional obligation was more uneven but surfaced consistently in how facilitators navigated tension between the Story*Circles* design and the constraints of teachers' working lives. These differences became most visible in moments of uncertainty—when correcting risked silencing teacher voices, when pressing forward risked undermining trust, or when honouring institutional constraints risked narrowing ambition—and it is in those moments that the orientations the caricatures capture became most distinct. The findings also support prior characterisations of facilitators as adaptive professionals who navigate tensions between program goals and teachers' needs (Fransson et al., 2009; Jacobs et al., 2017).

In response to the second research question—in what ways facilitators' varied stances contribute to a collective fellowship of practice that supports teachers' learning of problem-based instruction—the six caricatures reveal contrasts in emphasis across disciplinary precision, interpersonal trust, institutional feasibility, individual growth, equitable participation, and disciplinary stewardship. These orientations represent different ways of taking up the facilitator role in Story*Circles*, rather than simply individual idiosyncrasies. They help explain why facilitation practices described in prior research, such as mediating conflict, treating participants as co-learners, and steering discussions toward disciplinary goals, may be enacted differently across facilitators (Karsenty et al., 2023; Perry & Booth, 2024; Prediger et al., 2022). No single orientation is sufficient on its own, particularly in Story*Circles*, where teachers

carry the demanding work of designing problem-based lessons that expose the full complexity of mathematics teaching practice. Just as Tolkien's fellowship needed warriors, allies, and guides, effective facilitation in Story*Circles* may require these diverse orientations working in complement: The Samwise orientation creates safety that makes risk-taking possible; the Merry orientation models being a learner rather than an authority while remaining accountable to PD goals; the Aragorn orientation keeps the work connected to teachers' real constraints; the Legolas orientation safeguards mathematical integrity by placing disciplinary expertise in service of teachers rather than above them; the Galadriel orientation holds mathematics at the centre without taking it over; and the Gimli orientation ensures that collective knowledge belongs to the whole group rather than flowing from any single authority.

The six caricatures also reveal something more: each orientation carries within it the seed of its own corruption. Taken too far, the Samwise orientation protects relationship at the cost of rigor, the Aragorn orientation narrows ambition to what is merely survivable, and the Galadriel orientation becomes withholding disguised as wisdom. Each facilitator is pulled toward the good they recognise as legitimate, and each is most vulnerable to the Ring's temptation precisely in the domain of their greatest strength—where the acquisition logic whispers most persuasively that they already know what is needed. It is precisely because those pulls differ across orientations that the fellowship holds together: each member checking the others' tendency to pursue one legitimate good at the expense of competing considerations, together sustaining the conditions under which teachers can keep choosing participation over acquisition.

Importantly, the fellowship metaphor also signals a limit that applies to facilitators individually. Boromir—arguably the Fellowship's most capable warrior—sought to claim the Ring not out of malice but out of desperate love for his people and genuine belief that he could wield it for good. His corruption was not weakness but the pursuit of one legitimate good without the check of competing considerations. He became not a villain but a cautionary portrait of what any orientation looks like when it stops being one voice in a fellowship and starts believing it is sufficient on its own. Facilitators who take over lesson design, resolve the uncertainty teachers need to carry, or use expertise to control rather than open the mathematical space enact the same logic (Milewski et al., 2018). The Ring must remain with Frodo: what teachers carry on this journey cannot be resolved on their behalf, regardless of how capable or well-intentioned the facilitator. The work belongs irreducibly to the bearer; the fellowship's role is ensuring responsibility remains with them.

## Limitations and Implications

The analysis is based on a small sample of 12 facilitators, and the caricatures are not intended as exhaustive descriptions of their reflections but as a means of surfacing recurring themes in how facilitators navigated professional obligations in Story*Circles*. While neither the research design nor sample size supports generalisable claims, the patterns described highlight enduring challenges and commitments that may resonate with facilitators in other practice-based PD settings. The analysis rests on two years of sustained deliberation about facilitators' obligations, supported by interview protocols designed with depth and intention—an engagement that provides richness and resonance that make the portraits meaningful while acknowledging their limits.

The caricatures contribute to an emerging account of what professional obligations look like for facilitators of practice-based PD, extending Herbst and Chazan's (2011) framework beyond mathematics teaching to those who facilitate teacher professional development. They may offer a resource for those who design, recruit, or reflect on facilitation in PD contexts, suggesting that no single orientation is sufficient and that programs benefit from attending to the range of stances facilitators bring—not to standardise facilitation, but to understand how diverse orientations work in complement. The intent is not to prescribe how facilitators should enact their role but to offer portraits illustrating varied ways facilitators can support teacher learning from the practice of mathematics teaching while honouring teachers' knowledge of practice.

The caricatures also contribute to theorising how facilitator identity is jointly constituted through the systemic affordances of institutional positions, which make certain obligations more salient and orientations more available, and the personal resources, histories, and epistemic commitments that individual facilitators bring to that role. The obligations framework, applied to facilitation, holds both dimensions together—neither reducing facilitators to the positions they occupy nor treating their orientations as purely individual, but understanding them as practitioners whose professional identities form at the intersection of structural demands and personal agency. A fuller theoretical account of how facilitator orientation mediates between the structural concept of role and the individual experience of facilitation remains beyond the scope of this study and is left for future work.

## Conclusion

This study set out to explore the hypothesis that facilitators of practice-based PD recognise professional obligations that shape how they manage their role. Obligations that, like those of mathematics teachers, bind them to multiple stakeholders simultaneously. The findings support this hypothesis. Despite varied institutional roles and professional histories, all 12 facilitators recognised disciplinary, interpersonal, individual, and institutional obligations in their work in Story*Circles*. What differed was not whether they felt these obligations but how they prioritised and enacted them in moments of uncertainty. Through caricature analysis, these differences become traceable to facilitators' role histories, proximity to classroom teaching, and relational stances. These differences suggest that facilitators' recognition of obligations may owe as much to their professional trajectories and identities as to the design of the PD itself. These findings also suggest that the content vertex of the PD triangle (Carroll & Mumme, 2007)—the practice of teaching mathematics—may be more epistemically complex than its instructional counterpart. Rather than drawing on a single discipline, facilitators steward this vertex by drawing on multiple sources of validity, including mathematics, mathematics education research, research on teaching, and educational psychology. Facilitators may recognise obligations to these sources differently depending on their preparation, experience, and institutional contexts. The variety of obligations surfaced by this study may therefore reflect not only differences in relational stances, but also differences in how facilitators apprehend the content vertex and the sources of validity to which they hold themselves accountable when navigating practice-based professional development.

*Corresponding author*

Amanda M. Brown
University of Michigan
610 E University Ave, Ann Arbor, MI 48109, United States
amilewsk@umich.edu

*Acknowledgements*

This has been supported by NSF grant DRL 2201087 to A. Brown and P. Herbst. All opinions are those of the authors and do not necessarily represent the views of the foundations.

*Funding*

Ethical approval for the research was granted by the Institutional Review Board of the University of Michigan, and informed consent was given by all participants for their data to be published.

## *Ethical approval*

Ethical approval for the research was granted by the Institutional Review Board of the University of Michigan, and informed consent was given by all participants for their data to be published.

## *Competing interests*

The authors declare there are no competing interests. The research presented in this manuscript is the result of an independent investigation and has not received any financial support that could potentially introduce bias.

# References


Borko, H., Jacobs, J., Seago, N., & Mangram, C. (2014). Facilitating video-based professional development: Planning and orchestrating productive discussions. In Y. Li, E. A. Silver, & S. Li (Eds.), *Transforming mathematics instruction: Multiple approaches and* practices (pp. 259–281). Springer International Publishing. https://doi.org/10.1007/978-3-319-04993-9_16

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77–101. https://doi.org//10.1191/1478088706QP063OA

Brown, A. M., & Herbst, P. (2023). On designing better structures for feedback in practice-based professional development: Using "failure" to innovate. *Journal of Mathematics Teacher Education*, *26*(5), 581–605. https://doi.org/10.1007/s10857-023-09588-1

Brown, A. M., & Herbst, P. (2025). Working collectively to design and use online teacher education curriculum: How do teacher educators organize themselves to accomplish this task? *Digital Experiences in Mathematics Education*, 1–46. https://doi.org/10.1007/s40751-025-00181-0

Brown, A. M., Jeon, S., Herbst, P. G., Fletcher, A., Savuran, R., Walton, M., Kumar, R., & Nivera, G. (in press). Facilitating cross-national lesson exchanges: Challenges and effective strategies in virtual professional development. *ZDM–Mathematics Education.*

Bruner, J. (1986). *Actual minds, possible worlds*. Harvard University Press. https://doi.org/10.4159/9780674029019

Campbell, J. (1949). *The hero with a thousand faces*. Pantheon Books.

Carroll, C., & Mumme, J. (2007). *Learning to lead mathematics professional development*. Corwin Press.

Chazan, D. & Herbst, P. (2023). Extending use of instructional exchanges to teacher education. *Frontiers in Education*, 8, Article 1163396. https://doi.org/10.3389/feduc.2023.1163396

Chazan, D., Herbst, P., & Clark, L. (2016). Research on the teaching of mathematics: A call to theorize the role of society and schooling in mathematics instruction. In D. Gitomer & C. Bell (Eds.), *Handbook of research on teaching* (5th ed., pp. 1039–1097). American Educational Research Association.

Cohen, D., Raudenbush, S., & Ball, D. (2003). Resources, instruction, and research. *Educational Evaluation and Policy Analysis*, *25*(2), 119–142.

Creswell, J. W., & Poth, C. N. (2016). *Qualitative inquiry and research design: Choosing among five approaches* (4th ed.). SAGE Publications.

Fransson G., Van Lakerveld, J., & Rohtma, V. (2009). To be a facilitator of inservice learning: Challenges, roles and professional development. In A. Swennen & M. van der Klink (Eds.), *Becoming a teacher educator* (pp. 75–88). Springer.

Ghousseini, H., & Sleep, L. (2011). Making practice studyable. *ZDM–Mathematics Education*, *43*(1), 147–160. https://doi.org/10.1007/s11858-010-0280-7

Goldstein, L. S. (2005). Becoming a teacher as a hero's journey: Using metaphor in preservice teacher education. *Teacher Education Quarterly*, *32*(1), 7–24. https://www.jstor.org/stable/23478686

Herbst, P. & Chazan, D. (2011). Research on practical rationality: Studying the justification of actions in mathematics teaching. *The Mathematics Enthusiast*, *8*(3), 405–462. https://doi.org/10.54870/1551-3440.1225

Herbst, P. G., & Chazan, D. (2023). Keeping theorizing in touch with practice: Practical rationality as a middle range theory of mathematics teaching. In A.-K. Praetorius & C. Y. Charalambous (Eds.), *Theorizing teaching: Bringing together expert perspectives to move the field forward* (pp. 189–224). Springer.

Herbst, P., Chazan, D., Brown, A., & Mesa, V. (2023). Professional obligations in mathematics courses for teachers. In S. Cook, B. Katz, & D. Moore-Russo (Eds.). *Proceedings of the 25th Annual Conference on Research in Undergraduate Mathematics Education,* Omaha (pp. 864–872).

Herbst, P., & Milewski, A. (2018). What StoryCircles can do for mathematics teaching and teacher education. In R. Zazkis & P. Herbst (Eds.), *Scripting approaches in mathematics education: Mathematical dialogues in research and practice* (pp. 321–364). Springer. https://doi.org/10.1007/978-3-319-62692-5_15

Higgins, J., & Parsons, R. (2011). Professional learning opportunities in the classroom: Implications for scaling up system-level professional development in mathematics. *Mathematics Teacher Education and Development*, *13*(1), 54–76. https://mted.merga.net.au/index.php/mted/article/view/46

Jacobs, J., Seago, N. & Koellner, K. (2017). Preparing facilitators to use and adapt mathematics professional development materials productively. *International Journal of STEM Education*, *4*(1), Article 30. https://doi.org/10.1186/s40594-017-0089-9

Karsenty, R. (2021). Implementing professional development programs for mathematics teachers at scale: What counts as success? *ZDM–Mathematics Education*, *53*(5), 1021–1033. https://doi.org/10.1007/s11858-021-01250-5

Karsenty, R., Pöhler, B., Schwarts, G., Prediger, S. & Arcavi, A. (2023). Processes of decision-making by mathematics PD facilitators: the role of resources, orientations, goals, and identities. *Journal of Mathematics Teacher Education*, *26*, 27–51. https://doi.org/10.1007/s10857-021-09518-z

Knapp, M. C. (2017). An autoethnography of a (reluctant) teacher leader. *The Journal of Mathematical Behavior*, 46, 251–266. https://doi.org/10.1016/j.jmathb.2017.02.004

Lambdin, D. V., & Preston, R. V. (1995). Caricatures in innovation: Teacher adaptation to an investigation-oriented middle school mathematics curriculum. *Journal of Teacher Education*, *46*(2), 130–140. https://doi.org/10.1177/0022487195046002007

Linder, S. M. (2011). The facilitator's role in elementary mathematics professional development. *Mathematics Teacher Education and Development*, *13*(2), 44–66. https://mted.merga.net.au/index.php/mted/article/view/41

Maaß, K., & Doorman, M. (2013). A model for a widespread implementation of inquiry-based learning. *ZDM–Mathematics Education*, *45*(6), 887–899. https://doi.org/10.1007/s11858-013-0505-7

Margolis, J., & Doring, A. (2012). The fundamental dilemma of teacher leader-facilitated professional development: Do as I (kind of) say, not as I (sort of) do. *Educational Administration Quarterly*, *48*(5), 859–882. https://doi.org/10.1177/0013161X12452563

Milewski, A., Gürsel, U., & Herbst, P. (2017). Working collectively to design online teacher education curriculum: How do teacher educators manage to do it? In E. Galindo & J. Newton, (Eds.), *Proceedings of the 39th Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education,* Indianapolis, IN (pp. 112–119). Hoosier Association of Mathematics Teacher Educators.

Milewski, A. M., Herbst, P., Bardelli, E., & Hetrick, C. (2018). The role of virtual spaces for professional growth: Teachers' engagement in virtual professional experimentation. *Journal of Technology and Teacher Education*, *26*(1), 103–126. https://www.learntechlib.org/p/181094/

National Science Foundation. (2017). *Discovery research PreK–12 (DRK–12): Program solicitation NSF 17–584.* https://www.nsf.gov/funding/opportunities/drk-12-discovery-research-prek-12/500047/nsf17-584/solicitation

National Science Foundation. (2023). *Discovery research PreK–12 (DRK–12): Program solicitation NSF 23–596.* https://www.nsf.gov/funding/opportunities/drk-12-discovery-research-prek-12/500047/nsf23-596/solicitation

Perry, E., & Booth, J. (2024). The practices of professional development facilitators. *Professional Development in Education*, *50*(1), 144–156. https://doi.org/10.1080/19415257.2021.1973073

Prediger, S., Roesken-Winter, B., & Leuders, T. (2019). Which research can support PD facilitators? Strategies for content-related PD research in the Three-tetrahedron Model. *Journal of Mathematics Teacher Education*, 22(4), 407–425. https://doi.org/10.1007/s10857-019-09434-3

Prediger, S., Roesken-Winter, B., Stahnke, R., & Pöhler, B. (2022). Conceptualizing content-related PD facilitator expertise. *Journal of Mathematics Teacher Education*, 1–26. https://doi.org/10.1007/s10857-021-09497-1

Randles, C. (2012). The "hero's journey": A way of viewing music teacher socialization. *Journal of Music Teacher Education*, *22*(1), 11–19. https://doi.org/10.1177/1057083711403000

Schwarts, G., Herbst, P. G., & Brown, A. M. (2025). "I don't understand the purpose of this experience": Tensions in collaborative, process-oriented professional development for mathematics teachers. *Mathematics Teacher Education and Development*, *27*(1), Article 3. https://mted.merga.net.au/index.php/mted/issue/view/1225

Schwarts, G., Stevens, I., Herbst, P. & Brown, A. M. (2022). It's a different mindset here: Facilitation challenges in a practice-based professional development. In A. E. Lischka, E. B. Dyer, R. S. Jones, J. Lovett, J. Strayer, & S. Strayer (Eds.), *Proceedings of the 44th Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education*, Nashville (pp. 1461–1469). Middle Tennessee State University.

Sfard, A. (1998). On two metaphors for learning and the dangers of choosing just one. *Educational Researcher, 27*(2), 4–13. https://doi.org/10.3102/0013189X027002004

Tolkien, J. R. R. (1954a). *The fellowship of the ring*. George Allen & Unwin.

Tolkien, J. R. R. (1954b). *The two towers.* George Allen & Unwin.

Tolkien, J. R. R. (1955). *The return of the king*. George Allen & Unwin.

Tolkien, J. R. R. (2012). *The lord of the rings: One volume.* William Morrow.

Wood, R. C. (2003). *The gospel according to Tolkien*. Westminster John Knox Press.

Worth, S. (1974). Seeing metaphor as caricature. *New Literary History, 6*(1), 195-209.

# Appendix A

## *Selected Semi-Structured Interview Questions*

The following questions are drawn from the sections of the facilitator interview protocol concerning professional obligations and sources of professional judgment. Participants were reminded of the four professional obligations introduced during the preceding year: obligations to the discipline, the individual, the interpersonal, and the institution.

1. *Do you feel that, as a facilitator, you have similar obligations to those of a teacher?*
2. *Were there moments—either during StoryCircles discussions or in your own reflections—when it felt like multiple obligations were in tension?*
    a. *What were those obligations?*
    b. *How did those tensions show up, and how did you or the group navigate them?*
3. *As a facilitator, did you experience moments where you yourself felt pulled between different kinds of responsibilities or obligations?*
    a. *How did you handle these situations?*
4. *Can you think of a moment during a StoryCircles meeting when you were unsure how to respond?*
    a. *What did you find yourself drawing on in that moment—whether it was a past teaching experience, disciplinary knowledge, or something else?*
    b. *Looking back, were those resources helpful in those situations? In what ways were they helpful or not helpful?*