Conceptualising Primary School Mathematics Leadership as Poly-Motivated Activity

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This paper conceptualises mathematics leadership using cultural-historical activity theory (CHAT). Qualitative data were generated with three primary school mathematics leaders and analysed focusing on motive objects of activity. Analysis showed that the leaders directed their leadership at multiple motive objects, establishing mathematics leadership as poly-motivated activity. This conceptualisation reveals the interplay between building relationships, developing teachers' practice and knowledge, and managing demands of the leadership role. The findings contribute to mathematics leadership theory and offer implications for practitioners and researchers.

Mathematics leadership in schools is crucial in improving and sustaining effective mathematics teaching and learning (Driscoll, 2022; Sexton, 2023). It is, however, a complex form of practice (Sexton, 2019). Reasons for its complexity include navigating the positionality of the middle leading role (Sexton, 2023); responding to role clarity challenges (Copping, 2022); and negotiating demands concerning access to and the use of physical, temporal, financial, and human resources (Copping, 2022; Driscoll, 2022; Sexton, 2019). As a relatively new inquiry area, researchers have called for further conceptualisations of practice to make greater sense of the complex functioning of this form of middle leading practice in schools (Sexton, 2019; Vale et al., 2023). In this paper, I use cultural-historical activity theory (CHAT), drawing on the concept of *motive object*, to interpret data about mathematics leadership. By analysing the motive objects of activity, I aim to see how a CHAT perspective offers a conceptualisation of primary school mathematics leadership as *poly-motivated activity*.

Literature and Theoretical Background

This section begins by outlining middle leadership as a form of school practice to provide the context for understanding mathematics leadership. I then describe specific actions that characterise primary school mathematics leadership before introducing a CHAT perspective of human practice. The section concludes with the research question that is answered in this paper.

Middle Leading

Middle leadership is understood as a form of practice that is enacted in the space *between* executive school leadership (principal and deputy principal) and the teaching that happens in classrooms (DeNobile, 2018; Grootenboer 2018). Middle leading is associated with formal roles of responsibility (Grootenboer, 2018), and in primary schools, this is often linked to curriculum areas such as mathematics (Copping, 2022; Driscoll, 2022; Sexton, 2023). Through their practice, middle leaders are generally responsible for influencing school organisational development, realised through improved student learning outcomes as well as teachers' professional learning (Grootenboer, 2018). Middle leaders work in and about classrooms, positioning them as closely connected to teaching and learning in schools.

Contemporary middle leadership theory has moved away from reports of leaders' traits and characteristics to a focus on the actions enacted by middle leaders (Grootenboer, 2018). A way of understanding the nature and function of middle leading actions, they can be classified using categories of *leadership* and *management* work (DeNobile, 2018). With middle leading being highly contextualised, that leadership and management work undertaken by middle leaders is

enabled and constrained by conditions, structures, and resources available within the school. Such provisions are usually provided by principals because of their executive positioning and authority within the school leadership system (Grootenboer, 2018).

Mathematics Leadership Practice

Mathematics leadership is interpreted as a form of middle leading practice in schools that influences mathematics teaching by facilitating teachers' professional learning (Copping, 2022; Driscoll, 2022; Sexton, 2023). Mathematics leaders' actions have been categorised as *leading* and *managing* activity, with leading work focused on influencing teachers' dispositions, practices, and knowledge for mathematics teaching, and managing work focused on coordinating resources and organising conditions for professional learning (Sexton, 2019).

Primary school mathematics leaders are pivotal agents of change, influencing teaching practices through leading and managing actions (Sexton, 2019; 2023). Research shows mathematics leaders' work primarily focuses on site-based professional learning to enhance teachers' mathematical content and pedagogical content knowledge (Cheeseman & Clarke, 2005; Copping, 2022; Driscoll & Cheeseman, 2022; Sexton, 2023). This leadership incorporates leading assessment data analysis, developing teachers' planning practices, and providing in-classroom support through team teaching (Cheeseman & Clarke, 2005; Driscoll, 2022; Sexton, 2019; Vale et al., 2021). Mathematics leaders facilitate teacher learning through collaborative practices, including staff meetings, formal and informal coaching conversations, and classroom visits (Cheeseman & Clarke, 2005; Sexton, 2023). Additionally, mathematics leaders work on developing shared understandings of mathematics teaching through professional learning they lead in their schools (Roche et al., 2022; Sexton, 2023).

Mathematics leaders' management work is understood as organising and managing administrative tasks, coordinating resources, and documenting work for accountability reasons (Cheeseman & Clarke, 2005; Sexton, 2023). This managerial dimension continues to be significant, with mathematics leaders responsible for creating and distributing documents such as timetables for school-based professional learning (Sexton, 2019), managing mathematics resources through purchasing and auditing routines (Cheeseman & Clarke, 2006; Sexton, 2019), and organising assessment data collection and storage (Copping, 2022).

Recently, middle leading research reports the role of relational trust and how middle leading is inherently relational and dialogic (Grootenboer, 2018). This is documented in mathematics leadership research, showcasing that leaders deliberately work on building relational trust (Sexton & Lamb, 2023). Mathematics leaders have emphasised the purpose of relationships, positioning them as vital when leading professional learning (Copping, 2022; Driscoll & Cheeseman, 2022). These relationships mediate engagement in dialogue about practice problems and facilitate shifts in practice that reciprocally nurture further trust (Eden, 2018).

CHAT Perspective of Human Practice

CHAT is considered a practice-based theory, suitable for researching educational leadership (Nuttall et al., 2024). Within CHAT, practice is understood as collective activity realised through joint labour processes where practical and psychological development is drawn forward simultaneously (Engeström, 2015; Nuttall et al., 2024). CHAT recognises activity as always *object-oriented* meaning that central to understanding human practice, attention must be paid to the motive objects of activity (Kaptelinin, 2005; Leont'ev, 1978). The CHAT concept of motive object is interpreted as the undertakings, tasks, or goals that form the focus of practice (Nuttall et al., 2015). Motive objects are pursued by people and provide reasons for activity and are the entity at which activity is directed, acting as driving forces of activity (Kaptelinin, 2005).

Leont'ev (1978) introduced the idea of poly-motivated activity to understand the complex and contradictory nature of human practice. Complexity surrounds because, when engaged in practice, humans often direct their activity at more than one motive object. This is due to the desires, wants, and aspirations that humans attach to motive objects in response to the ever-shifting nature of activity (Miettinen, 2005). Therefore, humans can respond to multiple motive objects that are shaped by shifting desires and goals (Leont'ev, 1978; Miettinen, 2005).

Considering the literature and theoretical background and the calls for a conceptualisation of mathematics leadership, the research question for this paper is: Using a CHAT perspective, how does focusing on the motive objects of activity provide a coherent conceptualisation of mathematics leadership practice enacted in primary school sites?

Research Design

The findings in this paper are drawn from my doctoral study, which used CHAT to examine how mathematics leadership sustained teaching reforms following participation in a large-scale, system-wide school mathematics intervention (Sexton, 2023). As a practice-based theory, CHAT is a suitable theoretical frame and offers methodological tools for studying mathematics leadership as a form of middle leading practice (Sexton, 2019; 2023; Sexton & Lamb, 2023).

Theoretical Framework

CHAT supports inquiry into the relationship between humans, their environments, and their practices, focusing on how activity shapes and is shaped by the context in which the activity is enacted (Engeström, 2015). Rooted in Marxist and Vygotskian thought and further developed by Leont'ev, CHAT emphasises the importance of motive objects, acting as the motivation for activity (Nuttall et al., 2024). Motivation, however, is not understood as an individual psychological construct but rather as an enactment of culturally meaningful, collective activity where motive objects serve as the primary carrier of motivational force (Engeström, 2015; Leont'ev, 1978). For this reason, motive objects are understood as teleological, offering a way to analyse what is done in activity and why it is undertaken (Kaptelinin, 2005).

Context and Participants of the Study

The *Contemporary Teaching and Learning of Mathematics* (CTLM) project engaged 82 Catholic primary schools within the Melbourne Archdiocese from 2008 to 2012. Schools participated in a two-year professional learning program designed and facilitated by Australian Catholic University (ACU) and Catholic education personnel. School participation required all staff involvement in off-site professional learning and the appointment of at least one staff member to undertake the middle leadership role of *School Mathematics Leader*. Throughout CTLM, those mathematics leaders supplemented teachers' professional development by facilitating school-based professional learning and undertaking management tasks that mediated the implementation of pedagogical ideas and advice highlighted in the CTLM project.

Three mathematics leaders, Penny, Cindy, and Rachel (pseudonyms), who participated in CTLM in 2011 and 2012, were participants in my study. The leaders were from three different primary schools and had sustained their leadership roles following the end of CTLM. The participants were selected for their ongoing enactment of mathematics leadership over time and their willingness to participate in longitudinal data generation designed to generate insights into their leadership activity during and after participation in the CTLM project.

Data Generation and Analysis

Data were generated from November 2014 to February 2018 using the methods of semi-structured interviews, observations, and document retrieval. Data generation focused on collecting information about mathematics leadership before, during, and after participation in

the CTLM project. Each participant was individually interviewed about their leadership before (~75 minutes) and during CLTM (~85 minutes). Interviews were also used before (~15 minutes) and after (~60 minutes) observations of post-CTLM project leadership practice (~70 minutes per observation) where relevant documentation was collected (e.g., meeting agendas). I visited each participant's school at least five times and observed enactment of their leadership (~65 minutes per observation) at least eight times each time during the data collection period. A total of 48 interviews were conducted, along with 21 observations of the leaders' practice. With document retrieval, 24 artefacts were offered as ones deemed important by the participants. All data were imported into NVivo™ for management and analysis.

A coding scheme including CHAT (e.g., motive object) and literature (e.g., positionality) concepts was used to drive a deductive thematic analysis (DTA) approach (Fereday & Muir-Cochrane, 2006). The concepts in the coding scheme were used as nodes within NVivo™, allowing the systematic tagging of data. The analytical process involved reading (e.g., looking for phrases like "I am working on..."), coding, and examining data in collaboration with doctoral supervisors. Guided by the CHAT principle that activity is always object-oriented (Leont'ev, 1978; Kaptelinin, 2005), particular attention was given to how participants described the nature and purpose of their leadership actions—what they were working on, trying to achieve, or directing their efforts toward. These utterances, actions, and recordings in artefacts were treated as indicative of motive objects. Within the data tagged under the 'motive object' node, inductive analysis revealed a set of recurring orientations to the participants' leadership. These orientations informed the development of themes that frame the findings in this paper.

Findings and Discussion

Given MERGA conference paper limitations, the findings are reported and discussed simultaneously in relation to the background and theoretical literature to support the claim presented in this paper. By focusing on the concept of motive object as an analytical tool (Kaptelinin, 2005), the data analysis process found that the mathematics leaders collectively pursued three motive objects of activity. I interpret these as *relational*, *developmental*, and *managerial* motive objects realised through specific leadership actions and undertakings (Nuttall et al., 2015). These are reported in this order of their prevalence within the dataset.

Relational Motive Object

The relational motive object captures mathematics leadership undertakings that build relational trust with colleagues. The mathematics leaders intentionally directed their leadership towards building relationships, confirming previous research on the centrality of collegial relationships in mathematics leadership (Copping, 2022; Driscoll & Cheeseman, 2022; Sexton & Lamb, 2023). Through their talk about and observations of their leadership, the mathematics leaders enacted actions that were deeply relational and social, shaped by a commitment to fostering relational trust for and about mathematics teaching.

This was evidenced by Cindy, who undertook her school's mathematics and general curriculum leadership roles. She shared the importance of relational trust building, especially with colleagues who may have experienced mathematics anxiety:

> Relationship plays a big part in leadership, even more so with maths leadership. There is something about mathematics, trust and relationships that allows me to know how my teachers really feel about maths and their teaching of it, especially the teachers with maths anxiety. They need to know they can share their feelings with me.

The leaders actively created collaborative dialogical spaces characterised by empathy and respect (Eden, 2018). Their work was deeply tied to relational trust, as highlighted by Sexton and Lamb (2023), where providing safe spaces for teachers to discuss successes and practice problems was privileged. Rachel exemplified this through the following comment:

> The relational part is really important with being a maths leader and working with teachers, and I do think it's different in maths. You're working with people with different understandings of maths, and they need to feel like it's okay to share that. Relationship plays more of a role.

The mathematics leaders enacted an approach that privileged relationship building amongst themselves and their colleagues, with a work focus on remediating teachers' relationships with mathematics. Penny revealed this through the following comment:

> I'm trying to build that relationship with them (teachers) so that it allows them to see that they can be great maths teachers. I guess you can say that I am building relationships through maths. Relationships with them, and relationships with maths. Better people through maths; all of us better together through maths.

This finding reinforces that mathematics leadership is as much about relationships as it is about leading mathematics pedagogy and knowledge development (Copping, 2022; Driscoll & Cheeseman, 2022; Sexton & Lamb, 2023). The finding also reinforces that mathematics leadership is grounded in relational trust, which serves as a key motivational force of mathematics leadership activity.

Developmental Motive Object

The developmental motive object embodies actions that improve teachers' pedagogical approaches for effective mathematics teaching. Enactment of this motive object was specifically observed during teachers' planning meetings that the leaders facilitated, again revealing that mathematics leaders leverage teachers' planning meetings as professional learning opportunities (Driscoll, 2022; Sexton, 2023; Vale et al., 2021). Within those meetings, the leaders influenced how teachers planned for mathematics teaching by attending to curriculum expectations, selecting tasks, identifying differentiation prompts, and effectively using questioning, physical materials, and assessment strategies. Penny exemplified the enactment of this developmental motive object when she shared:

> I work a lot on differentiation with the teachers like how to individualise and differentiate the activities and tasks, using what I know about enabling and extending prompts. Differentiation is a big issue for the teachers, so I tend to focus on that quite a bit. We talk about how to differentiate by posing different questions or using a particular concrete material with a group of kids.

Rachel highlighted activity directed at developing teachers' use of mathematical tasks, emphasising that simply selecting tasks was insufficient:

> I spend a bit of time helping the teachers become aware of good tasks to use when teaching. I think they need to have a set of tasks and activities that they know are good in helping the kids learn the maths. But there's more to it than just choosing tasks, so I also help them know how to use the task or the activity in the maths lesson. I mean, you can have a great task, but if you can't use it properly, it doesn't stay a great task.

The mathematics leaders modelled strategies for using tasks as they led dialogue about approaches to make mathematics content more accessible to students. Their leadership extended to supporting teachers' use of representations for mathematical concepts, using learning trajectories to identify tasks and differentiation prompts, addressing student misconceptions, and aligning tasks and intended learning with curriculum expectations.

Enactment of leadership that pursued the developmental motive object focused on enhancing teachers' pedagogical content knowledge (PCK) and documenting shared understandings of PCK by creating *collective commitments*. The commitments acted as visions for practice (Roche et al., 2022), ensuring that teachers had a shared approach to mathematics teaching. This leadership action was evidenced by Penny through this comment:

> The teachers need to understand what a good teacher of mathematics looks like, the key components of a maths lesson, and how to differentiate tasks for the kids. I make that part of our shared thinking in facilitated planning (meetings). I focus on that vision for teaching maths with the teachers.

The leaders' actions toward the developmental motive object were mediated by knowledge of teachers' professional learning strengths and needs. This knowledge was developed through ongoing work of pursuing the relational motive object and was influenced by their position as middle leaders (Grootenboer, 2018; Sexton, 2023). Their work primarily focused on developing teachers' PCK through the facilitation of planning meetings as professional learning opportunities, paying attention to lesson design through task selection and use in classrooms.

Managerial Motive Object

The managerial motive object was realised as the mathematics leaders worked on purchasing, managing, and organising a range of resources, confirming previous research that management is a required element of mathematics leadership (Cheeseman & Clarke, 2005; Copping, 2022; Driscoll, 2022; Sexton, 2019). The managing of resources included physical resources such as concrete materials for classroom use and teacher reference texts used in planning meetings; financial resources, which included maintaining yearly budgets allocated to mathematics; temporal resources that required time management of the allocation assigned to their leadership role; and spatial resources which include the management of spaces where teachers can engage in collective professional learning. This claim about the managerial motive object was supported by Rachel when she commented on her enactment of managing actions:

> Look, management is part of the role. It's not a leading vs. managing thing. You need to do both. There's a bit to manage, like the materials for the teachers and students to use, along with the books that we use to help with planning. I also have a budget that I get each year, and I have to use it by the end of Term 3. I also need to manage my time as in how much release time I have in the week to lead professional learning, checking in with teachers and visiting their classrooms. I have to also check when the planning rooms are free so I can lead the facilitated planning (meetings).

One finding of interest concerned how the mathematics leaders "managed up" by enacting advocacy for mathematics. This was specifically important after participation in CTLM. The mathematics leaders reported that during CTLM participation, mathematics was a key school improvement area. However, after CTLM, the leaders reported how they managed by informing principals of the need to maintain an emphasis on mathematics. The leaders' commitment to mathematics drove them to actively manage the promotion of its significance, ensuring that mathematics remained on school improvement agendas. Cindy shared insights about this:

> I say to the principal, "I understand there's other things that have had priority, but when is mathematics going to get a guernsey again?" I see it as part of my role to fly the 'maths flag' and keep maths on the agenda.

Penny also shared how the managerial motive object was worked on by advocating for mathematics when faced with competing curriculum areas of improvement agendas:

> The focus has been the RE (religious education) curriculum renewal. I know part of my maths leader role is to keep managing maths, looking for ways for maths to have the status it had in CTLM and what it still needs. I keep cheering on maths.

Acting as a mathematics advocate was a key leadership action of the managerial motive object, but it did mediate tension for the mathematics leaders. Rachel exemplified this when she stated: "You have to promote maths as the maths leader and keep it as a focus area, but it's hard when you're not the principal. You get to do some things as a middle leader but not everything." This is further evidence that although they are leaders within the school site, they are not afforded the authority that executive leaders can enact due to their positionality as middle leaders within the school leadership system (Grootenboer, 2018; Sexton, 2023).

Mathematics Leadership as Poly-Motivated Activity

The identification of the relational, developmental, and managerial motive objects of activity provides evidence for the claim that mathematics leadership is poly-motivated activity (Leont'ev, 1978). The findings illustrate how mathematics leaders pursue multiple motive

objects and reflects the function of mathematics leadership as a complex and dynamic form of middle leading practice (Grootenboer, 2018; Sexton, 2019).

The poly-motivated nature of mathematics leadership is evidenced in how the three motive objects coexist and interact. For example, when the leaders worked on building relationships (relational motive object), they also created spaces to develop teachers' knowledge for mathematics teaching (developmental motive object). Similarly, when advocating for mathematics within improvement agendas (managerial motive object), they drew upon their relationships with principals (relational motive object) and the shared vision for mathematics teaching built through their professional learning leadership (development motive object).

This CHAT-informed conceptualisation advances prior understanding of mathematics leadership as leading and managing work (Sexton, 2019) by revealing that it is poly-motivated activity. Rather than serving a singular or dual function, mathematics leadership responds to multiple, interacting motive objects. This framing highlights the complexity and dynamism of the role, offering a CHAT-informed conceptual basis to guide future research and support the development of mathematics leadership as a form of middle leading practice in schools.

Conclusion and Implications

This paper conceptualised mathematics leadership as poly-motivated activity, drawing on the CHAT concept of motive object. The findings reveal that mathematics leaders direct their activity towards three motive objects that coexist and interact, reflecting the multifaceted nature of primary school mathematics leadership. The focus on motive objects provided a coherent conceptualisation of mathematics leadership as relational, developmental, and managerial activity. This conceptualisation offers a more nuanced understanding of mathematics leadership than perspectives focusing solely on leaders' traits or capturing mathematics leaders' activity as only leadership and management work.

This paper offers several important contributions. First, it provides a conceptual and practical framing for understanding the diverse undertakings enacted by mathematics leaders, demonstrating how they are motivated by different yet interrelated motive objects. Second, it highlights the importance of considering the individual and collective dimensions of mathematics leadership. Finally, it emphasises the dynamic nature of mathematics leadership, showing how leaders direct their activity to different yet related motive objects.

For mathematics leaders and principals, this CHAT-informed conceptualisation offers a lens for reflecting on practice. By recognising the poly-motivated nature of their work, leaders could develop greater awareness of how attention is allocated across motive objects. This awareness can support more intentional leadership that address the responsibilities of mathematics leadership. These findings highlight the importance of creating conditions that enable mathematics leaders to pursue all three motive objects effectively. For principals, this might include providing dedicated time for leaders to build relationships, leading teachers' professional learning, and undertaking management tasks, as well as providing the spatial and financial resources that facilitate the motive objects of mathematics leadership activity.

I acknowledge that focusing only on motive objects could be perceived as reductive. Research into the mediational means (e.g., cultural tools, rules, and division of labour) that shed light on their function, specifically how they enable and constrain leadership activity, will provide a richer conceptualisation of mathematics leadership. Further research might also identify how mathematics leaders address tensions when determining which motive objects to privilege at given times when enacting their poly-motivated leadership activity.

Acknowledgements

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