

Perceptions of the Role of Primary Mathematics Leaders

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Primary mathematics leadership has become a focus for improving the teaching of mathematics within Australian primary schools. Much of the training and support for those in the role have concentrated on content knowledge, rather than leadership training. There are currently no guidelines or standards in place to support the complex and multi-faceted roles and responsibilities of primary mathematics leaders. This paper reports on the initial stage of a research project examining how primary mathematics leadership is conceptualised and experienced. It reports on survey findings regarding teachers and leaders' understanding of primary mathematics leadership.

Primary Mathematics Leadership

Australian students' mathematics and numeracy performance in national and international testing have generally remained unchanged or declined in the last 15–20 years (Australian Curriculum, Assessment and Reporting Authority, 2017; Thomson, De Bortoli, & Underwood, 2017; Thomson, Wernert et al., 2017). This has prompted a re-evaluation of the approaches and support for mathematics education (Education and Training Committee, 2006; State of Victoria, 2017). Improving teacher capacity and confidence in teaching mathematics in primary schools has become a prominent focus nationally and in particular, within the state of Victoria. One initiative designed to improve teacher competency and confidence in mathematics has been to appoint mathematics leaders as part of the leadership team in schools. These mathematics leaders/specialists are more experienced and trained to support generalist primary teachers. This supports the Victorian Department of Education *Literacy and Numeracy Strategy* and focuses directly on the utilisation of middle level leaders in schools. These middle level leaders are expected to be instructional leaders with deep content, assessment and pedagogical content knowledge and focus on instructional coaching (State of Victoria, 2017). This places mathematics leadership at the centre of improving mathematics teaching and learning within schools.

Literature Review

Teacher leadership is a central component of leading mathematics in primary schools. Teachers that undertake mathematics leadership roles in schools are often categorised as “middle level leaders”. Middle leadership is a relatively new term used by schools and replaces the idea of “middle management”. This reflects the shift in roles from manager to leader and differentiates between administrative aspects of the role to a more strategic leadership focus (De Nobile, 2017). There are varying definitions of middle leadership, with most focused on the secondary school sector. Definitions recognise that the work of middle leaders is comprised of a formal and/or significant responsibility for a particular area of the curriculum, initiatives, or processes (Bennet et al., 2007; De Nobile & Ridder, 2014; Gurr & Drysdale, 2013). Within schools, the name of this middle leader role in primary mathematics has varied, such as “numeracy coordinator” (Cheeseman & Clarke, 2005), “mathematics education leader” (Eacott & Holmes, 2010), “school mathematics leader” (Sexton & Downton, 2014), and “primary school mathematics leader” (Driscoll, 2017). For the purpose of this study, previous definitions of middle leaders have been adapted and the term “primary mathematics leaders” has been defined as:

Teachers who have a formal and significant responsibility for improving student learning through mathematics education leadership of teaching teams, curriculum, resourcing, planning, instruction and assessment processes within the school.

The work of middle level leaders can be both complex and ambiguous (Gurr & Drysdale, 2013). A key factor in the work of middle level subject leaders is the middle leader's expertise as a teacher and in the subject matter that they are teaching (Harris, 2009). Their pedagogical content knowledge and assessment knowledge, along with their ability to analyse data has a critical impact on improving teacher impact and student learning (Bennett et al., 2007; Dinham et al., 2011). In a review of secondary curriculum leadership, Leithwood (2016) found a strong correlation between student performance and work conducted by the curriculum heads because, as an extension of the school's administration, the leaders have direct contact with teachers and students daily. Some mathematics leaders in primary schools also have a teaching aspect to their role, which can have a significant impact on classroom practices and educational outcomes due to their leadership in and between classrooms (Grootenboer, Edwards-Groves, & Rönnerman, 2015). It is this role of the middle leaders that has been found to be key to the successful implementation of improved practices in mathematics; they are critical in connecting the vision of the school to the enacted curriculum at the classroom level (Jorgensen, 2016).

A middle leader's role is varied and complex, containing many different aspects or practices that can be implemented in the undertaking of the leadership position. Leithwood et al. (2008) grouped these practices into four categories, similar to role categories developed by De Nobile (2017), who grouped them into six categories. There were also similarities found by Gurr and Drysdale (2013), where successful curriculum leaders had certain traits in common (see Table 1).

Table 1
Summary of Models of Middle Level Leadership Roles

Leithwood et al. (2008)	Gurr and Drysdale (2013)	De Nobile (2017)
Building the vision and direction	Focus on student learning	Student focus
Understanding and developing people	Interpersonal skills	Administration
Organisational change	Allocate resources	Organisation
Overseeing teaching and learning	Promotion and advocacy of area	Supervision
	Planning and organisation	Staff development
	Shared vision and purpose	Strategy
	Teacher learning	
	High expectations	

There are many influences that support or hinder the successfulness of leading and improving mathematics such as: the pedagogical content and assessment knowledge of the leader; high expectations and support for all students; the relationships the leader has with staff and the principal; the culture of the school; and the leader's ability to drive vision (Balka et al., 2010; De Nobile, 2017; Leithwood et al., 2008). Driscoll (2017) found that leaders self-reported challenges and influences on their role included: time, leader confidence, leader's expertise, teacher knowledge and funding. The alignment or acceptance of reform by the teaching body, and peer support for change have also been identified by mathematics teachers as challenging to successful leadership (Kitchen et al., 1997).

Traditionally in primary schools, the focus for mathematics curriculum leaders has been management of the curriculum, programs, and resources. Leaders must go beyond management, beyond making sure that things get done, a leader must enact change (Balka et al., 2010). Leadership is about recognising what the goal of the organisation or group is and ensuring that the goal is met. This is influenced through the actions and behaviours of the leader of the group (Balka et al., 2010).

The challenge therefore for practising primary mathematics leaders is to understand their own role and to develop their leadership skills in a context where there is often little guidance. This study examines the perceptions that teachers have of their roles as primary mathematics leaders and the challenges that they currently identify as barriers to successful leadership. This paper reports on a section from an initial survey that forms part of a PhD research study exploring how primary mathematics leadership is conceptualised and experienced by primary mathematics leaders.

Methodology

This study adopts a representative case study model where individuals from a range of relevant experiences are interviewed to provide insight, which may be generalisable when understanding how primary mathematics leadership is conceptualised. Yin (2017) defined case study research as a qualitative study that investigates a phenomenon (in this case, primary mathematics leadership), which is embedded within a real-life context. The context for this study is situated within a hierarchy of organisations, the school level, is the most basic level and dependent on localised factors. However, it is situated within the context of Victorian education policy and regulations, which are in turn informed by national policy and regulations. Using case study as a method for exploring roles within systems is also supported by Cohen et al. (2018).

The aim of this research is to gain a better understanding of how primary mathematics leadership is conceptualised by primary mathematics leaders, teachers, and other school staff, as well as those not in schools, who either inform policy and regulations or work with primary mathematics leaders, within the context of Victorian schools. In this research, data were collected from those in the role and those in the wider systems to build an understanding of the role of a primary mathematics leader and determine what can be learnt from these cases (Cohen et al., 2018).

Participants

Participants in the survey represented a wide range of roles in primary mathematics education, including teachers and leaders. Respondents also identified the postcode of the schools in which they worked, which enabled a range of perspectives from differing locations, according to the models classifying a geographical location based on the level of remoteness and population size (Modified Monash 2019 and ASGS 2016—Australian Geography Statistical Standard). There are more respondents from metropolitan areas than regional areas, but no respondents from rural areas.

Respondents were required to identify their role title from a drop-down menu. For those respondents who self-classified as a teacher, there were two distinct groups. The first group were classroom teachers who had responsibility for teaching mathematics in their classroom, or leading planning for mathematics within their team/year level group. The second group were almost all highly accomplished teachers or learning specialists, and one graduate teacher. This group had a much wider role and could perhaps be considered numeracy leaders, although they had not self-identified as mathematics leaders. They were, however, able to identify their leadership responsibility (Driscoll, 2017). Many of these teachers worked part time in the

classroom and part time as a mathematics specialist or numeracy coordinator. They listed duties such as coaching and planning across the school, organising and running staff professional development, and supporting teachers.

Within the group who had formally identified as mathematics leaders, most respondents were again classified as highly accomplished teachers or learning specialists. There was also one leading teacher and one teacher at the proficient classification. This designated position of mathematics leadership also included some with a current teaching role (Grootenboer et al., 2015). Four respondents in this group also stated that they still had a classroom teaching allocation. This may be the case for more of this group, however, this was not explicitly stated in their responses. The duties that they listed included similar aspects to the second group above, and additionally included comments referring to use of data, coaching, mentoring, modelling, and collaboration.

It is interesting that the teachers themselves were distinguishing whether they thought they were leaders or not. Perhaps the first group saw themselves as more of a manager, using the title co-ordinator (Cheeseman & Clarke, 2005) instead of leader, even though their role descriptions included aspects of leadership. It is important to see leadership as a developing process or a continuum, and perhaps these respondents could be considered beginning middle leaders. Driscoll (2017) noted that that some mathematics teachers lack confidence in their role as leaders and that leadership expertise develops over time. The key difference in the roles as defined by the two different groups appeared to be coaching, mentoring, collaboration, leading professional learning communities (PLCs) and using data.

Method

This paper focuses on the initial stage of the research project, a survey undertaken to map the field. Teachers and mathematics leaders were surveyed online, via a Qualtrics survey, on their conceptions of primary mathematics leadership. There were over 60 respondents. The survey included a mix of demographic questions, Likert scale questions, short answer questions, and open-ended questions, some of which enabled longer answers. For the purposes of this paper, the focus is on one of the questions from the survey, where respondents were asked “What do you think mathematics leadership is?”

Qualitative analysis of the data was undertaken using an inductive approach to determine emerging themes and to define codes. The data were analysed and interpreted to obtain common themes and concepts (Thomas, 2006). Themes and categories were created, and then summarised, refined and modified based on subsequent analyses (Cohen et al., 2018). In the coding of the data, meaning was sought through close examination of the data and categorised according to relevance (Thomas, 2006). These themes were then considered in light of middle leader role definitions used by Leithwood et al. (2008), De Nobile (2017), and Gurr and Drysdale (2013).

Results

Responses to the question “What do you think mathematics leadership is?” included a range of answers from single words to short sentences to longer paragraphs. Initial analysis created a large number of codes; however there appeared to be some overlap in areas. Some names of codes did not accurately reflect the group either, such as “ongoing professional learning”. This could appear to be focused on helping others with ongoing learning but was intended to reflect the ongoing learning of the leader. Subsequently some new codes were developed or renamed, to reflect the overlap and to reflect the five emerging themes more clearly. These can be seen categorised below in Table 2 with examples of responses.

Table 2
Results of Analysis

Themes	Sub-categories	Example responses
Culture	Buy in	Being able to bring teachers along in the journey
	Positive relationship	...being a cheerleader, acknowledging teachers' achievements and celebrating their success
	Valuing mathematics	...promote and lead mathematics in the school community
	Whole school approach	Leading the entire Mathematics culture of the school
Knowledge expertise	Content Knowledge	Mathematics leadership involves a deep knowledge of mathematics content and pedagogy.
	Curriculum knowledge	Having an excellent understanding of how to teach the breadth and width of the curriculum to all year levels
	Pedagogical content knowledge	Being flexible but also knowledgeable about pedagogies
	Expertise development	... leadership requires being aware of both current teaching and learning practices and new approaches that are trialled and reported.
Administration/management	Resourcing	Providing teachers with quality resources/ professional readings about current best practice
Teacher development	Staff development	Being able to understand your staff so you can upskill them in areas they need support.
	Use of PLCs	Developing strategies for improving teacher knowledge of curriculum and pedagogy with teacher through reflection in the context of a responsive and supportive learning community.
Student learning and assessment	Data and Assessment	To work with teams to look at their data and allow that to really drive what needs to come next for each student.
	Implementation and classroom practice	Leaders need to be able to support teachers implementing best practice
	Planning	Knowledgeable guidance and assistance in planning, implementing and analysing
	Student learning	Quality leadership in mathematics education is fundamentally about improving ... student outcomes.

Discussion

Culture

Participants' responses coded for the theme of "Culture" appear to resonate with ensuring that there is a whole school approach to mathematics at the school. This validated the idea of the role of a middle leader to develop strategy and build a shared vision and purpose (De Nobile, 2017; Gurr & Drysdale, 2013; Leithwood et al., 2008). Other responses within this theme mention encouraging staff, getting them on side and working positively with them, especially through change. This connects with the role of managing organisational change (Leithwood et al., 2008). Positive relationships appear to be an important factor, which aligns with a leader's need for effective interpersonal skills (Gurr & Drysdale, 2013). Promoting and valuing mathematics in the school and wider community were also included in this theme, supporting the importance of promotion and advocacy of the area (Gurr & Drysdale, 2013).

Knowledge Expertise

Knowledge expertise had many items within the themes. Although this did not seem to be a focus of the roles in the models discussed, subject expertise was considered important by the respondents. De Nobile (2017) suggested that knowledge of curriculum, pedagogy and assessment is a factor that influences the effectiveness of the middle leaders but does not list expertise as a role of middle leaders. In the specific case of mathematics leadership, there has been an assumption that leaders are experts (Jorgensen, 2016) and that they will pass on their knowledge and share expertise with teachers within their schools (Driscoll, 2017). Respondents concurred that expertise of the leaders in content, curriculum and pedagogy was central to primary mathematics leadership, which Harris (2009) suggested is necessary for curriculum leaders and stated that knowledge should be evidence based, and continually developing. Seeking feedback from other teachers and leaders about their own classroom practice was part of critical reflection and inquiry to improve their own practice. Respondents stressed the importance of knowing and understanding not only the content but also knowing and understanding how children learn that content and the best ways to teach it. Leaders were seen to exemplify best practice.

Administration/Management

The Administration/Management theme had the least number of items from respondents; however, it has been included due to responses in other survey items, such as, "Briefly describe the duties of your role", "What do you think are important attributes for a good mathematics leader?" and "What skills do you think are needed for a good mathematics leader?" These questions have helped to build a broader picture, but for the purpose of this paper, have not been included. Administration/Management is an important aspect of the role of a middle leader. Responses focused on organisation of classroom resources, tools and professional learning resources, aligning with De Nobile's (2017) identification of the roles of administration and organisation, and Gurr and Drysdale's (2013) classification of taking responsibility for area planning and organising and the allocation of resources.

Teacher Development

This theme included the largest number of responses. Responses varied from ensuring that teachers receive the professional development that they need as well as ensuring that all teachers are focused on school priorities. Participant responses included providing professional support to colleagues to strengthen their mathematics teaching pedagogy and supporting

teachers to seek, analyse, and act on feedback on their practice. De Nobile (2017) referred to the role of supervision for middle leaders. In this context, supervision is focused on mentoring and reflective practice, rather than regulation. Middle leaders adopt more collegial approaches, and are seen taking on a supportive role, rather than a disciplinary one. Teachers surveyed spoke of leading and collaborating with staff in building teaching practice to improve learning outcomes. Responses also included the responsibility for mentoring and/or coaching teachers and guiding professional learning. Respondents had discussions with teachers about professional development available to help them to address their performance and development plan goals. Teacher learning, along with high expectations of staff (Gurr & Drysdale, 2013), developing people and overseeing teaching and learning (Leithwood et al., 2008) support the theme of teacher development.

Student Learning and Assessment

Initially “student learning” and “planning and assessment” were separate themes. However, there was considerable overlap between the themes and the two were combined. Leithwood (2008) also combined teaching and learning together with a middle leader taking responsibility for the oversight of this area, while Gurr and Drysdale (2013) and De Nobile (2017) separated the role aspect to focus on student learning and did not tie it to planning. In a primary context, the monitoring of student cohort data was considered an important aspect of teaching practice. As stated by respondents, there was a real need for a mathematics leader to be able to analyse data, interpret that data and then target planning to identify needs at their school. This really focuses on overseeing teaching and learning through assessment. A leader’s knowledge and skills should be used to ensure all students are learning and continuing to improve in their learning, and assessment and data supports the process of identification of student need.

Conclusion

Analysis of the survey data in response to the question “What do you think mathematics leadership is?” has seen five themes emerge that reflect the perceptions of the respondents. These themes included middle level primary mathematics leaders viewing their role as complex and multi-faceted. Themes included: culture, knowledge expertise, administration/management, teacher development and student learning and assessment. These themes show alignment with previous research on middle level leadership (De Nobile (2017; Gurr & Drysdale, 2013; Leithwood et al., 2008) along with a clear need for expertise in primary mathematics content and pedagogical content knowledge. The survey will be followed by semi-structured interviews and document analysis (including school-based, policy, and procedural documents) to further investigate the conceptions and experiences of primary mathematics leaders and those who work with them.

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