2010, Vol. 12.2, 84–97 *Mathematics Teacher Education and Development*

Leading Reform in Mathematics Education: Solving a Complex Equation

Scott Eacott and Kathryn Holmes
The University of Newcastle

In recent times considerable attention has been devoted to the performance of schools and in particular, of students in literacy and numeracy. As part of a national agenda addressing what is portrayed as a crisis in numeracy, and hence mathematics education, governments have introduced a wide range of reform initiatives to improve performance. Examples include, national testing, a national curriculum and the 'Education Revolution' just to name a few. Comparative international tests such as TIMSS and PISA contribute to the performative nature of this policy environment which has significantly impacted on the leadership and management of mathematics education reform. The most significant influence has been the reduction of teaching and learning to what can be measured and the numerous, often uncritical, uses of comparative data on school and student performance. In this paper we examine the complexity of mathematics education reform by bringing together the discourses of mathematics education and educational leadership. In doing so, we develop and argue against a prescriptive 'how to' lead mathematics education reform, in favour of a more sophisticated framework of leadership for mathematics education which embraces both global and local developments in the field.

Mathematics education is currently under question nationally and internationally, as the number of students undertaking advanced mathematics in upper secondary school and tertiary institutions declines (Barrington, 2006). Numerous reports (Chinnappan, Dinham, Herrington & Scott, 2007; Hollingsworth, Lokan, & McCrae, 2003; McPhan, Morony, Pegg, Cooksey & Lynch, 2008; Rubenstein, 2006) speculate about the possible reasons for this phenomenon, citing a wide range of factors such as the irrelevance of current mathematics curricula, the intransigence of traditional mathematics pedagogy, inadequate teacher preparation and the changing nature of the current generation of learners in an increasingly digital age. All reports do agree, however, that the consequences of this decline are potentially dire, particularly with regard to the growing shortage of personnel in those careers requiring a strong mathematical foundation. Persistent social trends such as the one we are presently witnessing in mathematics education are difficult to slow or reverse. We argue that leaders of mathematics reform, to be productive in this endeavour, must recognise the full complexity of the problem and be able to apply a strategic approach which navigates a path through the historical, cultural, social, political and future perspectives in the field.

In Australia school performance is increasingly reported publicly, particularly in the areas of literacy and numeracy. As part of a national agenda addressing what is portrayed as a crisis in student outcomes in literacy and numeracy, and hence English and mathematics education, governments have introduced a wide range of reform initiatives to improve performance. Through

the use of the term 'crisis', we apply a perspective in which governments construct a crisis in the performance of a service, either public or private, and the only possible solution is to adhere to the proposal put forth by the constructors themselves. The rationale for the proposal usually comes in the form of an appeal to common sense, a simplified linear rational argument put forth in the name of progress. A selected example of proposals to address the education crisis by the current federal Labour government (2007-2010) include: the 'Education Revolution', national testing, the MySchool website, and a national curriculum.

Comparative international tests such as the Trends in International Mathematical and Science Study (TIMSS) and the Programme for International Student Achievement (PISA) further contribute to the performative nature of this policy environment which has significantly impacted on the leadership and management of mathematics education reform. The most significant influence has been the reduction of teaching and learning to what can be measured and the numerous, often uncritical, uses of comparative data on school and student performance. After all, if school leadership is being evaluated on performance in standardised tests and value added data, it is only to be expected that school based practitioners, both those with formal leadership titles and those without, will begin to make decisions which will reflect positively on those results. Anderson (2009) refers to this as 'leading to the test'. In short, the accountability regime of education becomes not only a measure of the system, but the system itself. In this paper we examine the complexity of mathematics education reform by bringing together the discourses of mathematics education and educational leadership. In doing so, we develop and argue not for a prescriptive 'how to' lead mathematics education reform, but rather for a more sophisticated framework of educational leadership literacies (Brooks & Normore, 2010) for mathematics education which embrace a 'glocal' perspective (Weber, 2007).

Locating the Work

Bates (2006) asserts that we need a conceptualisation of educational (in this case mathematics education) leadership that is more than the traditional administration of curriculum, pedagogy and evaluation, which are devised elsewhere and more about educational rather than administrative principles. In this context, there exists a need for scholarship and practice to move beyond modernistic thinking and embrace the ever shifting cultural, social, historical and political relationships which shape education. Appropriating Smyth's (1998) use of Spivak's (1988) 'enunciative space' in the specific domain of leadership in mathematics education, the framework described in this paper creates an opportunity to articulate what it means to be a leader of mathematics education reform; to tangle with the social issues beyond the technicalities of managing an institution; and having some agency within which to question and challenge the wider structures surrounding mathematics education reform.

The scholarly space from which this paper emerges is the ongoing research program of the first author and specifically, a currently funded project entitled

The Leadership Practices of Educational Managers. This work draws on Bourdieu's (1977) notion of practice, the critical perspective in educational administration from Bates (2008) and Smyth (2008), Weber (2007) among others' glocal perspective, and more recently Brooks and Normore's (2010) work on educational leadership literacies. As such, this work focuses on the practice of educational leadership in the context of mathematics education reform from a critical glocal perspective.

The term glocal refers to the "dialectic of the global and the local" (Weber, 2007, p. 280). While an abstraction, it is useful as a means of understanding how at the level of analysis it is impossible to isolate the local from the global. A myopic leadership focused on geographically local perspectives will not serve students well as they enter into a shrinking world where they will most likely compete and partner with other people/organisations on an international scale (Kapur & McHale, 2005). Many educators acknowledge that issues at the global level impact upon practice at the local. The thesis of our framework is that educational leaders must be 'literate' (Brooks & Normore, 2010) across a range of domains in order to lead mathematics education reform. The meaning of literacy(cies) continues to be elaborated and refined, but contemporary perspectives now encompass notions of active citizenship, new communication practices and information technologies, critical thinking, and linguistic and cultural diversity (Maclellan, 2008). We see engagement across multiple educational leadership literacies through a glocal perspective as imperative to establishing and sustaining an educative environment that is useful for students beyond the immediate classroom. The list of literacies included in this paper is selective, what we seek is to begin a conversation about the educational leadership spaces of mathematics education reform and invite critique and expansion of these ideas from multiple perspectives.

Our Place in Time

The Howard Government (1996-2007) undertook an assault – both ideological and structurally – on Australian education, most notably public education, and one that mirrors the Thatcherite reforms in England (Bates, 2008). The restructuring of education under the Howard government, built on a market ideology and a funding system that siphons resources away from the public school system under the auspice of market choice, has significantly altered the role of school leaders and education reform initiatives. The current federal Labor government's 'Education Revolution' has so far focused on buildings, the roll out of laptop computers to secondary students, the public release of a greater volume of school performance data and the development of a national curriculum, as opposed to addressing significant educative issues or the divisive education policy environment of the previous government, despite the rhetoric of public announcements.

Education is explicitly linked to economic sustainability and quality of life, an age old position which was so eloquently argued in Callahan's (1962) classic

Education and the Cult of Efficiency. In recent reports the economic impact of the existing mathematics education dilemma is highlighted as a key motivator for change. As such, the challenge of leadership knowledge for mathematics education reform is not only about the work of academics, but about the socio-cultural norms of progress and change that are part of the political nature of contemporary life. Literate and numerate citizens are considered imperative in the international competitive market place of contemporary life. Therefore, school performance in the areas of literacy and numeracy is a highly politicised issue. The performance or under-performance of schools, as measured on standardised tests at both the national and international level, is an avenue for considerable political leverage. Such power plays are evident in government policy initiatives (e.g. professional standards, league tables, performance pay, school-based management) and emerging/established social movements (e.g. school-based reporting, participative decision making). Many of the issues of educational leadership and school reform are problematic, although they are infrequently discussed in such manner. Education is however a political activity and therefore, educational leaders, at all levels and sectors, need to perceive themselves as political players in a large ideological struggle for power and domination within the larger social order (English, 2006).

Mathematics Education Reform

Calls for reform in mathematics education are not new (Schoenfeld, 2004), but considerable momentum was gained in the United States of America in the late 1980s with the release of the National Council of Teachers of Mathematics' *Curriculum and Evaluation Standards for School Mathematics* (1989) and later the *Professional Standards for Teaching Mathematics* (1991). These documents aimed to establish a set of clear guidelines for teachers in relation to school level mathematics, while taking a progressive stance with regard to the development of conceptual understanding as opposed to the enhancement of procedural skills in mathematics. In Australia there have also been moves to incorporate mathematical problem solving and process skills in many state syllabus documents, however there is evidence that the 'modus operandi' within many classrooms remains more aligned with the traditional pedagogical approaches which support the acquisition of procedural skills (Cavanagh, 2006).

Criticism of the reform movement in mathematics has focussed not on the intent of the movement, which is generally agreed upon, but on whether the intent is achievable given the complex nature of most educational settings (Apple, 1992).

While the mathematics classroom has remained somewhat unchanged over time (Hollingsworth, Lokan, & McCrae, 2003), the political, cultural and social contexts within which it operates have changed substantially, introducing multifaceted contexts within which reform needs to occur. The government is pressing ahead with 'educational' reforms on several fronts, all of which have the potential to impact upon classroom practice. Mathematics education leaders will

be playing 'catch-up' in a reactive manner if they fail to consider the implications in a way that allows them some input into any further reforms.

The political motivation for many of these reforms stems from Australia's relative position within international testing regimes, such as PISA and TIMSS. Our declining mathematics performance, as measured by TIMSS, was quoted by the then minister with responsibility for education, Julia Gillard, as a motivating factor for the development of a national curriculum and the channelling of new funding to the states to improve literacy and numeracy (Gillard, 2008). In response to the TIMSS results, the government also introduced measures to increase the number of specialist teachers in science and mathematics, recognising the growing shortage in those areas. Likewise, the PISA results have been employed to justify current government action. While Australia generally performs well in terms of mathematical literacy, as measured by PISA, Gillard points out that the results indicate that our top students are not performing as well as those in other countries and that we have an unacceptably long tail of students in the lower performing bands.

The current politically charged context poses many challenges for current and aspiring leaders of mathematics reform. With government funding contingent on school participation in national and international standardised tests, and with the recent publication of rudimentary school level data on the MySchool website, leaders must negotiate an educationally sound response to the current situation, while maintaining a focus on future possibilities. For mathematics, the local Australian condition is complicated by the worldwide phenomenon of a decrease in the quantum of suitably qualified mathematics teachers and mathematicians. In order to entice greater participation levels in mathematics throughout the school years, dramatic reform of traditional pedagogy may be required, and yet equally, may be less likely to eventuate due to the demands of 'teaching to the test' as accountability measures increase. These competing demands illustrate the growing complexity of the leadership 'space' within the educational sector generally and for subject areas like mathematics more specifically. The remainder of this paper will elaborate on a leadership framework designed to accommodate the increasingly difficult position of leaders of mathematics reform.

Leading Education Reform in Mathematics

Leadership for mathematics education reform requires the intertwining of many discourses. Figure 1 displays the framework that is central to this paper. It is not our intent to be exhaustive, but rather selective, and to make readers aware of the domains of knowledge, writ large, of greatest significance in the leadership of mathematics education reform. The purpose of the framework, as with the intention of the paper and special issue, is to bring the discourses of mathematics education and educational leadership into conversation. As the space available in a journal article is limited, choices need to be made in relation to depth verse breadth, and so consistent with the theme of this special issue, the remainder of

the discussion will focus on 'educational strategy' (the top left hand corner of the framework) and the interplay with the three domains on the right hand side of the framework (mathematical content knowledge; mathematics education practice; and professional learning in mathematics education).

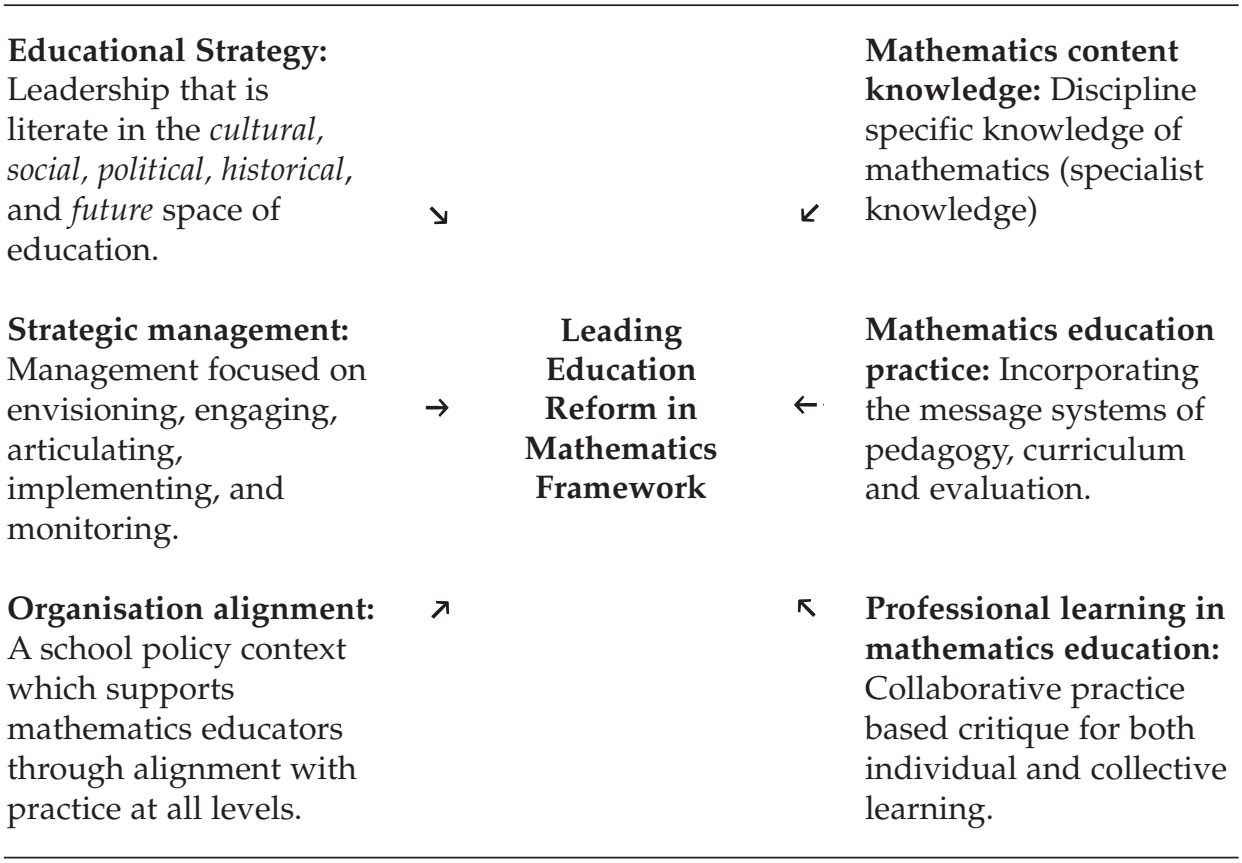

Figure 1. Leading Education Reform in Mathematics (LERM) Framework (adapted from Eacott, 2009)

Educational strategy within the Leading Education Reform in Mathematics (LERM) Framework allows for the investigation of and/or preparation for, leading reform without the need to be prescriptive about the role. Within this framework, leadership for mathematics education reform involves leaders conceptualising the context of their practice as constructed rather than fixed. To understand the leadership space in which they work, leaders must have an understanding of the collective unconscious (or cultural/educational) assumptions of their work, the value placed on their work by a diverse range of societal forces (social) and power relations (political).

In mathematics education, this involves leaders using and interpreting multiple sources of information (i.e. not just student assessment results), evaluating alternative points of view, and developing a reasoned and defensible argument for practice. A high level of understanding of this leadership space involves the leader acknowledging the many social forces which act upon practice. It requires a level of reflexivity to distinguish the persuasive mathematics education assumptions which inform educational leadership, an

understanding of the value placed on the work of schools and specifically mathematics educators through social exchanges with a diverse range of people, and an explicit awareness of the power relations between different social groups within and beyond the school.

Additionally, leaders must recognise that any given moment represents a point in time, the product of historical and contemporary struggles and developments. Any action represents a decision integrating both the conscious and the unconscious, based on timing. This requires an interpretation of the 'state of play', working at the macro- (greater society), meso- (systemic, organisational), and micro-level (interpersonal). Leadership must critically engage with the historical developments of mathematics education and focus on doing the right things at the right time. It is also equally important to know when to abandon a course of action.

While schools often operate within large bureaucratic structures and rigid regulatory frameworks, leaders are able to move beyond the blind conformity to rules and enact leadership strategies which actively promote and support innovation. This involves moving the debates from day-to-day operations of the school towards a desired future state. Not one defined by those beyond the school or even the field of education, but an educationally informed future state. As such, it requires leadership to focus on the future of the school through challenging incumbent practices and promoting innovation in the aim of becoming a field leading institution.

Educational Leadership Literacies for Mathematics Reform

In this section we briefly explain five educational leadership literacies from a glocal perspective with which leaders of mathematics education reform must be knowledgeable and conversant. As noted earlier, it is not our intent to be exhaustive, but rather selective. Our hope is that further inquiry will refine, extend and challenge our work. We present these literacies in no particular order.

Cultural Literacy

A substantial portion of educational leadership literature emphasises the need to understanding the culture of schools as dynamic organisations. Culture is usually defined as the shared philosophies, ideologies, values, beliefs, norms, expectations, attitudes that bind the school together as an organisation. This is frequently linked to the Romantic ideal that the leader can influence, manipulate or mould the culture of the organisation. Rather than contribute to this discourse, we conceptualise culture as the shared norms, values and attitudes of education, writ large, within the larger society. Being educationally literate or at least literate in the culture of education is imperative for leaders of educational institutions. With significant ties to other educational leadership literacies, cultural literacy is a reflexive concept in which an understanding of education is essential to making a reasoned and defensible argument for practice.

With regard to mathematics education reform specifically, leaders need to be

fully cognisant of the status quo with regard to mathematics classroom practice, before they can argue for meaningful reform. Although there are numerous critiques of conventional mathematics pedagogy, it would be a tactless leader that would totally discount current educational practice in the quest for significant reform. Rather, the leader should recognise the motivating factors for present behaviours so that any new reform can be framed as an extension of that space, thereby acknowledging and affirming the professionalism of colleagues and validity of stakeholders' views. It is generally established that teacher knowledge, beliefs and attitudes can either enable or pose a significant impediment to reform-minded teaching (Wilkins, 2008). Therefore, leaders should aim to acquire a nuanced understanding of the 'state of play' within their context so that moves toward a reform agenda are not stymied at the outset.

Taking a balanced view with regard to the melding of traditional and reformist pedagogies, the new national mathematics curriculum recognises the value of procedural skills through the inclusion of 'fluency' as one of the four process or proficiency strands embedded throughout the K-10 document (ACARA, 2010). The other strands (problem solving, understanding and reasoning) sit more comfortably within the reform schema, but for leaders, finding the optimal balance between procedural and conceptual pedagogies will remain a key challenge as the national agenda is implemented.

Social Literacy

The purpose and value of education is a contested terrain. Despite substantial scholarly discourse and political rhetoric, education and educational leadership exist within a range of discursive mechanisms. Before a leader can engage in the politics of educational leadership there is a need to be critically aware of the value placed on mathematics education by a diverse range of social groups. As mentioned earlier in this paper, the value placed on mathematics by various groups in society is disparate, with a growing decline in the number of students pursuing the study of higher mathematics and related careers. This decline can be placed alongside the demand and value that society place on these careers, indicating a possible divergence between collective and individual values in relation to the worth of mathematics education.

We live in an increasingly 'instant' society with vast information sources at our fingertips, requiring us to develop considerable skill in the speed with which we process new data. These new cognitive processes are at odds with the level of cognitive concentration required for the acquisition of deep mathematical understanding. In this context, society may be losing its tolerance for attaining knowledge that requires a sustained level of deliberation. Leaders of mathematical reform, while recognising these social changes, will need to consider the means by which mathematics can be moulded to become an attractive prospect for future students.

Political Literacy

Schools were once considered to be closed systems, but this is far removed from the practical reality of school leadership and educational practice. School based management and the uncritical call for participation in decision making by a range of stakeholders only further highlights the need for leaders to be politically literate. Following Johnson (2003) we characterise politics as "the study of power, influence and authority in the allocation of scarce and valued resources at various levels of education sectors" (p. 51). Brooks and Normore (2010) suggest that a politically literate educational leader from a glocal perspective is familiar with formal and informal processes by which people engage with local and national issues and the consequences and outcomes of those processes.

In the context of leading mathematics education reform this translates into knowledge and understanding of current contexts at a local, national and international level. In Australia at present, it is the federal agenda that is driving school reform. Mathematics reform is at the forefront, with numeracy highlighted in published National Assessment Program for Literacy and Numeracy (NAPLAN) results and, with mathematics featuring in the first round of national curriculum documents to be implemented from 2011 onwards. Thus, mathematics is being portrayed as an important discipline of study and student performance on national numeracy tests by school is publicly available as a measure of school performance. The value of this simplistic data is under question, however, its importance as a measure of educational attainment for public consumption, despite its imperfections, is indisputable.

Leaders in mathematics reform should be consciously aware of the value of the published data when considered from multiple perspectives. Parents have enthusiastically embraced the availability of the data, but principals, on the other hand, lament its simplicity, and therefore by implication, its value as a measure of school performance. Hence any consideration of the data by mathematics education reformers needs to consider numerous viewpoints before either dismissing or utilising the data as an agent of change.

The national agenda is undoubtedly driving educational discourse in Australia at present, however, the federal agenda is in part determined by international contexts and in particular, Australia's performance on competitive international tests such as TIMSS and PISA. The test results are generally used to support the government's agenda for reform. In fact, even when the results are relatively favourable in relation to competing countries, as is the case with PISA, they are still used politically in order to justify planned reforms. Leaders of mathematics reform should be aware of the multiple political agendas in play, in order to develop appropriate responses and actions to support meaningful reforms.

Historical Literacy

Failure to acknowledge the historical dimensions of action is a critical flaw in leadership scholarship and practice (Eacott, 2010). Leadership strategy is always a work in progress where any decision is the product of historical and contemporary struggles and developments. Understanding the temporal features of leadership allow for the design and implementation of meaningful educational change. Without a working knowledge of the history of a faculty, school and community, not to mention the local, national and global system, leaders run the risk of getting stuck in practices that yield no improvement. Most importantly, an understanding of history allows for leadership to avoid the mistakes of the past.

It could be argued that mathematics reform has remained in a 'holding pattern' since the 1980s, with a general consensus of opinion about 'what' needs to occur, but little consistent evidence to support 'how' best to go about it. The TIMSS Video Study 1999 reveals a somewhat dour picture of the reality within typical Australian classrooms. In the Year 8 classrooms studied it was found that in most mathematics lessons, the subject matter was of low procedural complexity, highly repetitive and devoid of any discourse related to mathematical reasoning (Stacey, 2003). More recently, teaching practices that promote a cultural approach to pedagogy, while recognising the value of deep content knowledge have gained traction (Stigler & Hiebert, 2004), possibly indicating a way forward. However, the history of mathematics education and its associated pedagogy runs deep and its resistance to reform should be recognised by leaders as a major obstruction to be overcome.

Future Literacy

In addition to understanding the historical space in which leadership takes place, it is important for leaders to demonstrate a future focus. Strategic planning is the organisational process most frequently linked to embedding a future focus in organisations. However, many have criticised the role of strategic planning in education and the ability of planning to develop a future focus in organisations (Eacott, 2010). However, in mathematics education there are calls for consideration of new notions of mathematics literacy for the future. In particular, the content of current mathematics curricula is under question for ill-preparing students for the complexity of 'real life' situations. There is a growing sense that "mathematics textbooks and tests tend to represent only a shallow, narrow, and often non-central subset of those that are needed for success" (Lesh, Hamilton, & Kaput, 2007, p.vii). Computer based modelling applications of mathematics and statistics are possibly under-represented in most school curricula, and there are questions related to the capacity of the current teaching workforce to deliver technologically-based learning.

While the Rudd government's 'Education Revolution' may make progress in providing the hardware for future learning of this type, it will take significant leadership to transform mainstream pedagogy, especially in mathematics, where

an aging teaching workforce is widespread. As mentioned earlier, in mathematics there is a strong foundation of rigour and traditional pedagogy which could be considered to be at odds with the emerging digital education revolution which the government is progressing. The buzzwords associated with the learning styles of 'digital natives', such as creativity, experiential learning and multi-tasking do not sit comfortably with drill and practice, pen and paper, and the routine application of standard algorithms. The leader of mathematics reform must bridge the chasm between the historical development of mathematics as a discipline of study and its potential misalignment with the digital learners of the present time. The other four leadership literacies (social, cultural, political and historical) must be considered when looking to develop a future literacy of mathematics reform, as they all hold keys to unlocking the possibilities of reform. Whether it be recognition of teachers' beliefs, community attitudes or the increasingly influential political landscape, leaders must be able to sufficiently recognise the importance and degree of influence of each factor, so that effective plans for the future can be formulated.

Table 1 provides a simple overview of the educational strategy domain of the framework and what it looks like in practice.

Table 1
Educational strategy for mathematics reform

Leadership literacy	What does it look like in leadership practice?	What does it look like in the reform of mathematics education?
Cultural	Using and interpreting multiple sources of information, evaluating alternate points of view, and developing a reasoned and defensible argument for practice/s based on educational understanding.	Recognition of the pervasive nature of traditional mathematics pedagogy within school practice and its resistance to change. Acknowledgement of widely held public misunderstanding of the nature of mathematics reform.
Social	With strong ties to both the cultural and the political, social is concerned with a demonstration of the value placed on certain symbols, practices and artefacts by different groups within the school, local, national and global field.	Understanding of the social trends toward lower participation rates in advanced mathematics. Recognition of the multiple factors at play e.g., parental, digital media, lifestyle.

CONTINUED NEXT PAGE

Leadership literacy	What does it look like in leadership practice?	What does it look like in the reform of mathematics education?
Political	Demonstration of an understanding of the discursive nature of educational leadership. This may be evident through recognition of who values what (closely linked to social) and the multiple techniques in which groups/individuals employ to influence decision making.	A demonstrated understanding of the multi-levelled political forces at play: state, national and international testing, national curricula and funding factors. An awareness of the key positions of the various stakeholders: parents, teachers, students, political figures.
Historical	Critically engaging with the historical developments of initiatives and focusing on doing the right things at the right time. It is also equally important to know when to abandon a course of action.	Reform initiatives presented are based on a rationale recognising what has and has not worked in the past at the school and the local, national and global field. Support remains for policies and practices which can still be defended but discussions and decisions move beyond those that cannot.
Future	Moving debates from the day-to-day operations of the school towards a desired future state. As such, it requires leadership to focus on the future of the organisation through challenging incumbent practices and promoting innovation in the aim of being a field leading school.	Activities are aimed at the critique of contemporary practice and moving forward as educators through the synthesis of knowledge and skills from a glocal perspective. As such, the desired future state of practice is informed by the other four dimensions.

Each of the educational leadership literacies described above are ecological and therefore constantly changing. As concepts alter in one of the literacies, they necessarily influence others. As noted earlier, we have been selective in the domains presented. What we have offered are to be taken as points for consideration in the ever redefining of leadership for mathematics education reform. The current crisis in mathematics education heightens the need for informed, decisive action. Leaders in mathematics reform have a complex task, as the domains within which they operate are multi-faceted, interconnected and dynamic. These domains should be further debated and discussed, arguably the rationale for a special issue. In fact, if further debate or dialogue does takes place on the educational leadership of mathematics education reform then this paper will have served its purpose.

Conclusion

This paper is timely, as is the special issue, given recent policy moves within Australia and international developments in the fields of mathematics education and educational leadership. The Leadership for Education Reform in Mathematics framework developed in this paper is a significant contribution to the field combining macro-, meso- and micro-levels of organisational change. Widespread mathematics reform has proved to be an elusive goal for many educators over several decades. Future leaders will need to draw on manifold leadership literacies in order to make progress toward a time where the decline in participation in mathematics education is reversed and teaching for conceptual understanding is commonplace.

References

Australian Curriculum, Assessment and Reporting Authority [ACARA}. (2010). *Australian Curriculum Mathematics K to 10 – Draft consultation version 1.0.1.* Sydney: ACARA.

Anderson, G. L. (2009). *Advocacy leadership: toward a post-reform agenda in education*. New York, NY: Routledge.

Apple, M.W. (1992). Do the standards go far enough? Power, policy and practice in mathematics education. *Journal for Research in Mathematics Education, 23*(5), 412–431.

Barrington, F. (2006). *Participation in year 12 Mathematics across Australia 1995–2004*. Melbourne: International Centre of Excellence for Education in Mathematics, Australian Mathematical Sciences Institute.

Bates, R. J. (2006). Presidential address: public education, social justice and teacher education. *Asia-Pacific Journal of Teacher Education, 34*(3), 275–286.

Bates, R. J. (2008). States, markets and communities: is there room for educational leadership. *Journal of Educational Administration and History, 40*(3), 195–208.

Bourdieu, P. (1977). *Outline of a theory of practice*. Cambridge, UK: Cambridge University Press.

Brooks, J. S., & Normore, A. H. (2010). Educational leadership and globalization: literacy for a glocal perspective. *Educational Policy, 24*(1), 52–82.

Callahan, R. E. (1962). *Education and the cult of efficiency*. Chicago: The University of Chicago Press.

Cavanagh, M. (2006). Mathematics teachers and working mathematically: Responses to curriculum change. In P. Grootenboer, R. Zevenbergen, & M. Chinnappan (Eds.), *Identities, Cultures and Learning Spaces* (Proceedings of the 29th annual conference of the Mathematics Education Research Group of Austalasia, pp. 115–122). Canberra: MERGA.

Chinnappan, M., Dinham, S., Herrington, A., & Scott, D. (2007). Year 12 students' participation in higher mathematics. In J Watson, & K., Beswick (Eds.), Mathematics: Essential research, essential practice (Proceedings of the 30th annual conference of the Mathematics Education Research Group of Australasia, p. 119). Hobart: MERGA.

Eacott, S. (2009). *The leadership practices of educational managers*. Unpublished project paper.

Eacott, S. (2010). Strategy as leadership: an alternate perspective to the construct of strategy. *International Studies in Educational Administration, 38*(1), 55–64.

English, F. W. (2006). The unintended consequences of a standardized knowledge base in advancing educational leadership preparation. *Educational Administration Quarterly, 42*(3), 461–472.

Gillard, J. (2008, December 10). Improvement in Maths needed if Australia wants to count. [Press Release]. Canberra: DEEWR.

Hollingsworth, H., Lokan, J., & McCrae, B. (2003). *Teaching Mathematics in Australia: Results from the TIMSS 1999 Video Study*. Camberwell, Victoria: Australian Council for Educational Research.

Johnson, B. L. (2003). Those nagging headaches: perennial issues and tensions in the politics of education. *Educational Administration Quarterly, 39*(1), 41–67.

Kapur, D., & McHale, J. (2005). *Give us your best and brightest: the global hunt for talent and its impact on the developing world*. Washington, DC: Center for Global Development.

Lesh, R., Hamilton, E., & Kaput, J. (2007). *Foundations for the Future in Mathematics Education*. New Jersey: Lawrence Erlbaun Associates.

Maclellan, E. (2008). Pedagogical literate: what it means and what it allows. *Teaching and Teacher Education, 24*(8), 1986–1992.

McPhan, G., Morony, W., Pegg, J., Cooksey, R., & Lynch, T. (2008). *Maths? Why Not?* Canberra: Department of Education, Employment and Workplace Relations.

National Council of Teachers of Mathematics. (1989). *Curriculum and evaluation standards for school mathematics*. Reston, VA: NCTM.

National Council of Teachers of Mathematics. (1989). *Professional standards for teaching mathematics. Reston, VA: NCTM.*

Rubenstein, H. (2006). *Mathematics and Statistics: Critical Skills for Australia's Future*. Melbourne: Australian Academy of Science.

Schoenfeld, A. H. (2004). The math wars. *Educational Policy, 18*(1), 253–286.

Smyth, J. (1998). Finding the 'enunciative space' for teacher leadership and teacher learning in schools. *Asia-Pacific Journal of Teacher Education, 26*(3), 191–202.

Smyth, J. (2008). Australia's great disengagement with public education and social justice in educational leadership. *Journal of Educational Administration and History, 40*(3), 221–233.

Spivak, G. C. (1988). Can the subaltern speak? In C. Nelson & L. Grossberg (Eds.), *Marxism and the interpretation of culture* (pp. 27–313). Urbana, IL: University of Illinois Press.

Stacey, K. (2003). The need to increase attention to mathematical reasoning. In H. Hollingsworth, J. Lokan & B. McCrae (Eds.) (2003). *Teaching Mathematics in Australia: Results from the TIMSS 1999 Video Study* (pp. 119–122). Camberwell, Victoria: Australian Council for Educational Research.

Stigler, J.W., & Hiebert, J. (2004). Improving Mathematics Teaching. *Educational Leadership, 61*(5), 12–17.

Weber, E. (2007). Globalization, 'glocal' development, and teachers' work: a research agenda. *Review of Educational Research, 77*(3), 279–309.

Wilkins, J. (2008). The relationship among elementary teachers' content knowledge, attitudes, beliefs, and practices. *Journal of Mathematics Teacher Education, 11*(2), 13–164.

Authors

Scott Eacott, School of Education, The University of Newcastle, University Drive, Callaghan, 2308, Australia. Email: Scott.Eacott@newcastle.edu.au

Kathryn Holmes, School of Education, The University of Newcastle, University Drive, Callaghan, 2308, Australia. Email: Kathryn.Holmes@newcastle.edu.au