Mathematics Education as a Field of Research: Have We Become Too Comfortable?

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Mathematics education is highly regarded as a research field within our region, especially when compared to other fields within the broader education discipline. The field has been relatively cohesive, well organised and internationally influential in a universally strong field. Mathematics education research has developed and evolved in challenging times—when other fields have become fragmented and lost vision—have we more to offer? This keynote paper considers the challenges we face as a field of research as we navigate our theoretical underpinnings and pedagogical practices, within both the mathematical sciences and broader education disciplines.

The International and Regional Strength of Mathematics Education

As a field of research, mathematics education has developed a reputation of scientific strength within a relatively short timeframe. In terms of research intensity, the international reputation of mathematics education is one of considerable productivity and engagement. The field is internationally connected via the regular production of international handbooks, collaborative manuscripts, well-regarded journals, and a number of international conferences that attract participants from a diverse number of countries. These international conferences often have specific strength within particular aspects of mathematics education: including psychology (e.g., Psychology of Mathematics Education [PME]) and sociology (e.g., Mathematics Education and Society [MES]). Such is the magnitude of the mathematics education field.

More localised strength within the field usually comprises strong regional organisations like MERGA, well-organised conferences like the four-yearly ICMI-East Asia Regional Conference of Mathematics Education (EARCOME), or special interest groups within larger education conferences (e.g., mathematics education is the largest special interest group of the American Educational Research Association [AERA]). Such strength and connectivity is certainly not unique; nevertheless the national and international strength is somewhat privileged within the education discipline.

In terms of professional development and engagement, mathematics education researchers in Australia and New Zealand are somewhat advantaged. Our geographical "remoteness" and relative small populations have shaped our research-based organisations in dramatic ways. We have few discipline-based competitors and our scale ensures that we know each other well. Most members attend the annual MERGA conference on a regular basis—providing a connected network of scholars that develops both collective capacity and identity formation. Such remoteness also tends to develop a "collective" mentality, moving collectively to international conventions across the globe. Our members are regularly among the highest proportion of attendees outside that of the host country at international conferences like the PME. With perhaps the exception of science education, no other discipline-based field within education offers such strength and direction. Most disciplines in Australia and New Zealand rely on general national education communities (i.e., Australian Association of Research in Education [AARE] and New Zealand Association for Research in Education [NZARE]) to harness research strength. It is of no

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surprise that mathematics education does not have a special interest group at AARE—which is in stark contrast to that in the United States and AERA. Not only do we have strength in numbers, but our propensity to engage with colleagues from all over the world makes our international presence and reputation palpable.

Most, if not all, education-based discipline fields conduct research and professional practice that are abreast of both general-education and specific-discipline paradigms. For example, both the English and education fields influence literacy education researchers, while in human movement and education fields those researchers who concentrate on physical education. To this point, most discipline-based fields within education are concerned with the promotion of the discipline content and the pedagogical constructs that support the learning of the discipline. At least from a regional perspective, it would be fair to say that literacy and numeracy attract most of the attention from the collective education community—including politicians, policy makers, assessment experts, school communities and the general public. As mathematics education researchers, such community attention provides us with scope, capacity and opportunity not afforded to other fields of research within education—even strong fields such as science education. Although this may well be as good as it gets, mathematics education is a field with high credibility and sustained influence within the broader parameters of education research.

Enhancing Our Regional Reputation: Respectful Acknowledgement via Tradition or Ground-Breaking Innovation?

As Galbraith (2014) maintained, mathematics educators within our region have made a substantial contribution to the field internationally in terms of theoretical development and practical applications. This success can be gauged across various measures of impact and contribution. New Zealand has a past President of the International Congress on Mathematical Instruction (ICMI); and a winner of the Felix Klein Medal and the current Editor of *Educational Studies of Mathematics* (ESM) are from Australia.[1] Our members have been editors of several international handbooks and have contributed substantially to invited papers and keynote presentations at PME and the International Congress on Mathematics Education (ICME)[2]. In fact, our attendances at the annual PME conferences or as contributors to *International Handbooks of Mathematics Education* are higher than that of any other country, apart from the United States. For countries of relatively small populations, such international contributions are considerable (Singh & Ellerton, 2012). Indeed, they point to the strength of our research-based community. From its inception in the early twentieth century, mathematics education has been a field that has been dominated by European and North American mathematicians and mathematics educators (Singh & Ellerton, 2012). Yet MERGA members, in particular, have been able to establish enough credibility and presence to make an impact within such restricted structures. It is noteworthy that the only ICME conference to be held outside of the Northern Hemisphere was in Adelaide (1984), with Sydney contesting to hold the event in 2020—which would, if successful, be the second such occasion. Within the field we are certainly influential,

[1] Professor Bill Barton was President of ICMI from 2008–2012); Professor Gilah Leder was awarded the Felix Klein Medal for research excellence from ICMI in 2009; Professor Merrilyn Goos was appointed Editor of ESM in 2014.

[2] In the four ICME conferences since 2000, MERGA members have presented four plenary activities and 16 regular lectures.

despite our relatively small populations. Perhaps it is our size and isolation that shapes such successful practices?

Such data highlight the fact our members have been able to engage (and certainly contribute) internationally in an environment that has been focused on European and North American traditions. To some degree, these traditions remain self-absorbed and somewhat conservative. It may be the case that such attributes lend themselves well to mathematics education since "mathematics" tends to flourish on traditional approaches and foundation principles. The rise and rise of Asian countries in terms of prosperity and influence within the world's increasingly networked society (Castells, 2010) has begun to dramatically shift the education focus from Europe and North America. From a political perspective, attention first shifted toward Asia when it became apparent that Confucian-heritage nations consistently performed better than students from North America and Europe. Interestingly, the current fixation on comparing student performance across countries—along with the obvious performance advantage these Asian countries exhibit on the Programme for International Student Assessment and Trends in International Mathematics and Science Study—reinforces the notion that traditional and structured approaches to teaching mathematics are most effective.

In his keynote presentation in Singapore, Clements (2012) argued that a more inclusive MERGA could become a power block to rival those in North America and Western Europe. Both regionally and contextually, we are well placed to engage deeply with colleagues from Asia—indeed, many of us are doing so already. Anecdotally, I would suggest that at least half of our MERGA's current membership has sustained research relationships with colleagues and/or countries in Asia, and especially in southeast Asia. Respectfully, we have at least as much to learn from, and engage with, our colleagues in this region than we do from the traditional two blocks.

Mathematics Education and Mathematics

Mathematicians made most policy, curriculum and pedagogical decisions concerning mathematics education, as recent as thirty years ago (Clements, 2012). There were few *mathematics education specialists*—and those folk who possessed such skills were not influential. This landscape has changed dramatically, both regionally and internationally. As Fried (2014) commented:

> …over the last quarter century or so, and for better or for worse, this simple notion of where the core of mathematics education lies has been offset by goals and interests allying it, as an academic field, more closely with psychology of learning, cultural differences, and social justice, among others, than with mathematics itself. Thus, while the first two-thirds of the twentieth century could boast of great mathematicians such as Felix Klein, Jacques Hadamard, George Pólya, and Hans Freudenthal making contributions to mathematics education, today, not only are such figures rare in the field, they have also been to an extent alienated by it. (p. 12)

It is also the case that those innovative and highly capable mathematicians established our field. I am convinced that some of our colleagues today are just as creative and innovative, however the field is much larger—consequently, "big fish in a big pond". It would also be fair to suggest that our society is more complex and interactive than it was thirty years ago—demanding that we consider psychology, cultural differences and social justice dimensions with as much rigor and attention as mathematics content and processes.

For some time now, most of our mathematics education academics completed their doctorates in Australia or New Zealand—initially guided by a handful of our community's most respected researchers. The vast majority of these new doctoral scholars emerged from

a secondary teaching background. Only a handful of our new early career researchers moved into universities from primary or early childhood backgrounds—a pattern that has changed considerably in the past ten years. It could be argued that our discipline has stronger foundations within *education* than it does in *mathematics*, at least from the orientation of our community. In both Australia and New Zealand, mathematics educators are typically in Faculties and Departments that include other education experts—in contrast to many North American and European universities where mathematical science and mathematics educators belong to the same department. I seldom engaged with teacher educators in my first two sabbaticals to North America, yet was surrounded by mathematics colleagues. It is certainly the case that the discipline profile of MERGA members will look very different in ten years' time, with fewer people having mathematics as their major postgraduate qualification.

There has been a concerted effort to find common ground with our mathematics colleagues in recent years. This has especially been the case with MERGA under the leadership of Merrilyn Goos, with strong collaborative support from the Australian Association of Mathematics Teachers (AAMT). From a political perspective, this has included a determination to have a common voice with the Australian Mathematical Sciences Institute (AMSI), the Australian Mathematical Society (AustMS) and the Statistical Society of Australia (SSAI) on a range of issues. The cohesive and collaborative nature of our work (and common aspirations) was no more evident than in the concerted effort to host ICME-14 in Sydney in July 2020. The ICMI delegation were both surprised and overjoyed with the evident goodwill, common ground and working relationships that existed among our organisations—collectively and individually commenting that this was rarely seen elsewhere in the world.[3]

From a research perspective, however, this connectivity is less apparent. It may be the case that our philosophical lenses and ways of knowing are too dissimilar. As Brown (2010) argued:

> Mathematicians who see mathematics as an entirely abstract domain are a different breed to those attentive to its historical evolution and hence its potential immersion within the social sciences. To move from one domain to another requires a major switch in modes of thinking, from one conception of life to another. (p. 341)

Fried and Dreyfus (2014) produced a manuscript that encouraged mathematicians and mathematics educators to consider the common ground among their fields of research. They suggested that mathematicians were primarily concerned with content and ideas, and approaches for ensuring ideas could be presented as fluently as possible. By contrast, mathematics educators were concerned with students' thinking and how understanding is embedded in culture and everyday experiences. Any research nexus between the discipline fields seems to be closely associated with teachers of mathematics in the classroom. In mathematics education, this research tends to be associated with classroom teachers' content knowledge (CK) and pedagogical content knowledge (PCK). In mathematics, the research is associated with developing more informative assessment practices and the necessity to produce good quality teachers of mathematics.

Mathematics researchers have re-invented themselves in part, at least in our region, by necessity. Although mathematics education has become increasingly concerned with the mathematics knowledge our teachers possess when enrolling in education degrees, our

[3] The ICMI delegation were similarly impressed with how closely connected our Australian and New Zealand members were to our colleagues in Asia—as we presented a case for our regional cohesion.

mathematics colleagues are concerned with the decrease in the number of students wanting to undertake degrees with a mathematics specialisation. We may have too many students; by contrast they have too few. One way that mathematicians have responded to this loss of capacity is to become more broad or balanced in their scope. The term *mathematical sciences* has emerged, commonly defined in our region as "encompassing mathematics, statistics and the range of mathematics-based disciplines including the teaching of mathematics and teacher education". The first part of the statement is unsurprising, and the identification of mathematics-based disciplines increasingly necessary. For example, mathematics knowledge and tools have become critical to commerce and industry in an increasingly technological age. However, it is noteworthy that such statements about components that encompass mathematical sciences would mention teacher education. This may be a strategic decision that is politically astute to ensure the discipline remains vital and influential. After all, it must be difficult to "compete" for exposure and relevance in a science-dominated landscape (especially in terms of physics, chemistry and medical science). Although there must be some advantages of being considered a "hard science", there are challenges when your field is required to share the same research space.

Some of my mathematics colleagues lament at the challenge of demonstrating impact when the most prestigious journal in their field, *Annals of Mathematics*, has an impact factor of 2.8. They quote journals in engineering and general science with impact factors substantially higher than their gold standard. This is also the case in our field. *Educational Studies in Mathematics* has a far lower impact factor than the most well-regarded teacher education and general education journals (see Table 1). Science-based journals seem to be more widely read and quoted. The science-based journal equivalent to ESM would be *Journal of Research in Science Teaching*, which has an impact factor of 3.02.

Table 1
Impact Factors of Well-Respected Journals by Discipline Field

Journal	Discipline Field	Impact Factor
Educational Studies in Mathematics	Maths Education	0.6
Journal of Teacher Education	Teacher Education	2.2
Review of Educational Research	Education	5.0
Annals of Mathematics	Mathematics	2.8
International Journal of Civil Engineering & Technology	Engineering	9.1
Science	Science	31.4

In an environment of heavily reduced research funding opportunities, such cross-disciplinary comparison becomes relevant and potentially debilitating. Most large-scale and long-term research projects are funded within cross-disciplinary panels and assessment committees. No mathematics education consortium has been awarded an ARC Centre of Excellence or Cooperative Research Centre (CRC). In fact, no education-led consortia have ever been awarded such sustained funding to work on complex research questions. By contrast, our mathematics colleagues have recently been awarded an ARC Centre of Excellence in "Mathematical and statistical frontiers of big data, big models, new insights". The Centre is led by a statistician, Professor Peter Hall.

What our mathematical science colleagues have been able to achieve is commendable. They have been able to show how their discipline-based research can be applied to, and

have impact on, the broader community. For the ARC Centre of Excellence, they were able to demonstrate that the mathematical models they were going to develop would be vital to the Centre's collaborative domains, namely: healthy people, sustainable environments and prosperous societies. In order to receive such funding opportunities, we have some way to go—nevertheless, there are some positive signs concerning how our work is regarded on a national stage.[4]

Mathematics Education within the Education Discipline

In an Australian context, the Australian Research Council (ARC) Discovery Grants are often regarded as the gold standard. These grants allow researchers to frame research projects from a position of personal strength and focus. Unlike many funding schemes, the open nature of the funding rules has no set agenda—apart from the need to demonstrate national significance and innovation. Over the past ten years, mathematics educators have received a high proportion of funding from this scheme, relative to other disciplines within the field of education. In fact, of all grants awarded in the past ten years, mathematics educators have been awarded 20% of the grants—all of whom are members of MERGA. The data are more compelling when considering all grants awarded within the curriculum and pedagogy component of the education discipline—where almost all mathematics education grants are assigned. Within this categorisation, our members have been awarded 40% of the grants awarded by the ARC. Typically, success rates for this Discovery scheme are less than 20%, from a pool of the education disciplines' most highly regarded researchers. Although it is difficult to ascertain what the success rate for mathematics educators would be within this funding scheme, in some years it would be more than 50%. As a community of scholars, we must be doing something right! Table 2 provides data on the number of grants awarded by the ARC in the Discovery Scheme within the curriculum and pedagogy discipline, by content specialisation.

[4] The ARC awarded Special Research Initiative funding to a Science of Learning Research Centre in 2012. Although the Centre is led by neuroscientists and cognitive psychologists from a brain centre, pleasingly, a number of MERGA members are Chief Investigators in this Centre—raising the possibilities for mathematics education researchers.

Table 2
Grants Awarded in the Discovery Scheme (2005–2014) Curriculum and Pedagogy (4-Digit Code) by Year and Field Specialisation

Discipline Field	Total Awarded	Proportion (%)
Mathematics education	23	40%
Science education	17	30%
English/literacy education	5	9%
Technologies	3	5%
Physical education/health	2	3.5%
Curriculum/national	2	3.5%
Social justice	1	<2%
Democracy	1	<2%
Learning cycles	1	<2%
Assessment	1	<2%
Integration	1	<2%
Total	*57*	

There are a number of plausible explanations for this high proportion of success, relative to other sub-disciplines within the field. These grants are typically awarded to investigators with very strong research profiles, with 40% of the assessment criteria afforded to the research team's record of research productivity. A further 30% is awarded to the grant's contribution to national priorities and strength of the team's research environment. Mathematics, and specifically numeracy, is considered to be of critical importance to the nation's prosperity and capacity to remain competitive in global markets. To this point, our field is well placed to take advantage of the fact that numeracy (along with literacy) is afforded more attention politically than other areas of learning in schools. By contrast, the fields of arts education, human society or physical education rarely gain such community-based attention. Consequently, the general view that mathematics is necessary for the development of the next generation of global citizens, combined with the international reputations of the research team, ensures higher-than-average levels of success.

The "Education" That Surrounds Mathematics Education

One of the central criticisms of teacher education is that both research approaches and the implementation of practice(s) revolve around "cottage industries" that cyclically repeat and reinvent similar initiatives (McKernan, 2008). Elsewhere, I have argued that new frameworks need to be developed, trialled and implemented across different contexts and countries to provide research and practice opportunities which not only value add to previous initiatives, but reflect sophisticated research designs (Lowrie, 2014). A lack of sustained long-term research funding, and the challenge of meeting education jurisdictions' restrictive timeframes make such aspirations challenging. Moreover, education jurisdictions within countries generally require new approaches and innovations to be tailored to their specific cultural and political circumstances. As a result, research studies are difficult to replicate across jurisdictions. It is also the case that education research is complex. As Berliner (2002) maintained:

> In education, broad theories and ecological generalizations often fail because they cannot incorporate the enormous number or determine the power of the contexts within which human beings find themselves…. The participants in those networks have variable power to affect each other from day to day, and the ordinary events of life (a sick child, a messy divorce, a passionate love affair, migraine headaches, hot flashes, a birthday party, alcohol abuse, a new principal, a new child in the classroom, rain that keeps the children from a recess outside the school building) all affect doing science in school settings by limiting the generalizability of educational research findings. (pp. 18–19)

Context is critical to, and in, educational research. It could be argued that it is more influential in replicating findings than anything else. Even in studies of more than 200 participants, it is often difficult to replicate findings because the within-group variance is typically larger than the between-group variance. So many variables are at play, even for well-defined and structured treatment programs or multivariate analyses that provide a battery of instruments to "control" for variables. At the same time, student behaviour could be interacting with a teacher's mathematics knowledge, beliefs about pedagogy or even assessment practices—not to mention the socioeconomic status of the students of the community. Most large-scale studies are drawn from a participant base that is familiar to, or in close proximity of, the researcher's own context. This is also the case in educational psychology research. This might include undergraduate students drawn from the researcher's own university, or schools in their own district. Increasingly, it is difficult for "outsiders" to get into different and new jurisdictions within their own country, let alone another country.

In teacher education, in particular, small-scale qualitative research dominates (Adler, Ball, Krainer, Lin, & Novotna, 2005). As Adler et al. (2005) suggested, such findings are unsurprising since theory-practice relationships can be explored in authentic ways via teacher voice. It may also be the case that context and cultural aspects of the investigation are not generalisable until theorising and modelling can be established. Nevertheless, the criticism that teacher education is concerned predominately with a cottage industry is understandable—where most research is focused on what is taking place nearby and repeated in multiple sites across the world. Such perceptions are especially salient when most small-scale research is conducted with teachers with whom the researcher knows and has worked with in the past. In fact, as much as 80% of all investigations are conducted with relationships already formed (Adler et al., 2005). Given the competitiveness of securing external funding, and the challenges of securing ethics clearance from out-of-region jurisdictions, it is hard to imagine this changing in the foreseeable future.

Most of the research conducted in education research is situated within familiar contexts, irrespective of paradigm used to collect and analyse data. To some degree, our mathematics foundations provide opportunities for our work to be more varied than the descriptions presented above. Perhaps our well-designed cognitive models and theoretical frameworks provide some opportunities to cross boundaries more so than other fields within the education discipline? It may also be the case that the well-connected international community we belong to enhances such prospects. Brown (2010) has argued that this is not the case, since our education origins dominate our practice(s).

> …mathematics education research rests on supposed cognitive models in which the human being is understood in particular ways with pedagogical models/apparatus shaped accordingly. Yet, learning can be productively viewed as an experience through time where there are changes in both the human subject and the objects they apprehend… [since] the prominence of Piaget and Vygotsky in our research has overly restricted analytical opportunities. (Brown, 2010, p. 342)

Without cognitive models or theoretical frameworks to help us explain learning within socio-cultural contexts it is difficult to imagine moving beyond small-scale studies that (seemingly) have little impact on policy makers and practitioners alike. This may not be a bad thing, in and of itself, since research within the social sciences is complex and integrated—and to some extent the most sophisticated multivariate design becomes a single case study. However, as Galbraith (2014) pointed out, there are numerous theoretical frameworks at our disposal with which we can embed our research programs. Too much choice, it would seem?

Beyond Comfortable: Barricades, Warning Signs and New Opportunities

As a field of research, mathematics education would certainly be regarded as a success story—especially when compared to most fields within the education discipline. For the past thirty years our field has become increasingly diverse in terms of what research questions we pose, the theoretical underpinnings and lenses we adopt, and the methodological frameworks we construct in order to gather data. Perhaps some of our greatest achievements have been associated with issues of social justice, cultural diversity and affective dimensions of mathematics. To some degree, these contributions to teaching and learning show how essential our work is to *mathematics* and *education*.

At the same time I worry that our field has stagnated, at least in relation to some important mathematics topics. By way of example, the most highly regarded mathematics education researcher in my area of specialisation has had two articles published in the last twelve months that suggest nothing new has happened in the specific field for quite some time. The first manuscript had 34 references with no new worked cited over the past ten years, aside from the person's own work and cross-referencing from that very issue of the journal. The second manuscript is the entry from the *Encyclopedia of Mathematics Education.* It has 24 references, however none of the works cited in the topic area have been published in the last twenty years, aside from this person's own work. The citing of one's own work is understandable, especially someone so highly regarded. What I find most extraordinary about this is how much this specific field (topic) has changed in the last twenty years, in part due to technological advances. This topic has seen major contributions from neuroscience, cognitive psychology, educational psychology, and practical applications from chemistry in the past ten years; yet such research seems to have not shaped this sub-field (in mathematics education) at all! I suspect and worry that this might not be an isolated case. In his Forster/Clements keynote presentation at the 2014 MERGA conference, Peter Galbraith (2014) challenged us to consider any theory or practice in mathematics education that has outraged us—I find such practices bewildering and outrageous. As much for the fact that such highly regarded mathematics educators are able to get away with such practices. Perhaps this is why they are able to get away with it?

If I took a more restrained and considered approach, I would need to form a conclusion that the contributions from other disciplines do not add sufficient value to expand our field? Or perhaps there is nothing new or innovative to have come out in the past twenty years? Perhaps, what I think is new or innovative might just be replicating the seminal works of the past?[5] Notwithstanding these questions, it would be problematic (and perhaps

[5] This reminds me of my perception of popular music. Sam Smith is one of the most creative new talents in music. His hit single, *Stay with me*, sold more than 5 million copies and was a Number 1 hit in seven countries in 2014. Within six months of release, Smith was required to give co-writer credits to Tom Petty

reckless) to assume that our field can be barricaded by research in mathematics and mathematics education alone. As Lerman (2014) reminds us:

> Mathematics educators have traditionally drawn on psychology, but nowadays draw also on sociology, anthropology, philosophy, ethics and other fields. The central focus is, of course, the teaching and learning of mathematics, and thus the nature of mathematical activity and thinking are a crucial focus for study in the field.... (p. 65)

It is essential that we maintain our focus on the teaching and learning of mathematics, to flourish in such a competitive research environment. We will only remain relevant if we remain true to our core principles. It is also important that our research empowers people, and that our recommendations and implications improve systems, especially for the disadvantaged. Our research should also be fun! Nevertheless, it is conceivable that many other fields will shape our work into the future. Societies and communities are changing rapidly, which can only mean our work becomes more complex and integrated. In addition, we might well be simultaneously focusing on practice *and* theory, rather than one or the other. The theoretical frameworks and learning models we develop will need to have the flexibility to be applied in various practice-based contexts.

Over the next five years or so, many of our most influential mathematics education researchers will be transitioning into retirement, or have started that journey already. Many of the research leaders who have been most influential on my work are closer to 70 (or beyond) than they are to 60. Then again, I remembering thinking the same thing five years ago—perhaps they and their work are more enduring than I had first thought. They have strengthened our field considerably, especially in relation to establishing research programs that would be sustaining in a post-mathematician dominated landscape. That is, strengthening our field with sociology, anthropology and philosophy (Lerman, 2014), as well as considering the foundations of the mathematics, psychology and general education disciplines. The alienation of mathematicians from our field (as prescribed by Fried, 2014) seems to me to be more about generational change than anything else, in terms of both people and societies. We are nearing such a point in time again. We need our transitioning research leaders as much as ever; however, we also need new opportunities for our early career researchers. It will be interesting to see what the *profile* of the next wave of professors and research leaders will be. Will the majority of these folk come from school teacher and early childhood backgrounds? How many will have degrees in pure or applied mathematics? How many will have doctorates from outside of the Australian and New Zealand university systems? What proportion of these professors would have studied under our MERGA leaders currently transitioning into retirement?

Despite the dramatic generational change that will occur in the coming years, the core principles of *what MERGA is about* will remain relatively constant—such is the influence of those foundational MERGA leaders. However, our next phase of development might need to go beyond the professional support and camaraderie we all experience from our Association. The intentional support and connectivity we offer one another is atypical in education organisations, where policy, research and practice goals are often disparate and fragmented. The "cottage industry" raises its ugly head, not due to selfishness or ignorance but rather an embracing of idiosyncratic ways. Organisationally, MERGA needs to become more strategic by establishing a common voice on issues that really matter to us. This will not be easy, given our support for one another and of MERGA is always "in kind" support.

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and Jeff Lynne. It was revealed that the melody line of the song was astonishingly similar to their 1989 hit; ironically titled *I won't back down.*

It appears that our expertise and influence will move much further along the education spectrum, from a point that was much closer to the mathematics end of the spectrum when MERGA began. This might require different forms of engagement, whilst remaining true to our mathematics discipline ways. As Jorgensen (2014) indicated, we may need to build a transformative knowledge-making paradigm, which completing disrupts current (and past) pedagogical and classroom-based practices. Such dramatic shifts in how mathematics is taught would take time, both politically and organisationally. Nevertheless, such aspirational goals would position us to have more influence within education and school contexts. Our influence should be both discipline and practice based.

References

Adler, J., Ball, D., Krainer, K., Lin, F., & Novotna, J. (2005). Reflections on an emerging field: Researching mathematics teacher education. *Educational Studies in Mathematics, 60,* 359–381.

Berliner, D. (2002). Educational research: The hardest science of all. *Educational Researcher, 31*(8), 18–20.

Brown, T. (2010). Truth and the renewal of knowledge: The case of mathematics education. *Educational Studies in Mathematics, 75,* 329–343.

Castells, M. (2010). *The rise of the networked society (2nd Ed).* (2010). United Kingdom: Wiley-Blackwell Publications.

Clements, M. A. (2012). MERGA 2012: Where we've been, where we are, and where we're going. In J. Dindyal, L. P. Cheng, & S. F. Ng (Eds.), *Mathematics education: Expanding horizons* (Proceedings of the 35th annual conference of the Mathematics Education Research Group of Australasia, pp. 4–19). Singapore: MERGA.

Fried, M. (2014). Mathematics and mathematics education: Searching for common ground. In M. Fried & T. Dreyfus (Eds.), *Mathematics and mathematics education: Searching for common ground.* Dordrecht, The Netherlands: Springer.

Fried, M., & Dreyfus, T. (Eds.) (2014). *Mathematics and mathematics education: Searching for common ground.* Dordrecht, The Netherlands: Springer.

Galbraith, P. (2014). Custodians of quality: Mathematics education in Australasia where from? Where at? Where to? In J. Anderson., M. Cavanagh, & A. Prescott. (Eds.), *Curriculum in focus: Research guided practice* (Proceedings of the 37th annual conference of the Mathematics Education Research Group of Australasia, pp.38–53). Sydney: MERGA.

Jorgensen, R. (2014). Social theories of learning: A need for a new paradigm in mathematics education. In J. Anderson., M. Cavanagh, & A. Prescott. (Eds.), *Curriculum in focus: Research guided practice* (Proceedings of the 37th annual conference of the Mathematics Education Research Group of Australasia, pp.311–318). Sydney: MERGA.

Lerman, S. (2014). Expectations according to a mathematics educator. In M. Fried & T. Dreyfus (Eds.), *Mathematics and mathematics education: Searching for common ground.* Dordrecht, The Netherlands: Springer.

Lowrie, T. (2014). An educational practices framework: The potential for empowerment of the teaching profession. *Journal of Teacher Education, 40*(1), 34–46.

McKernan, J. (2008). *Curriculum and imagination: Process theory, pedagogy and action research.* New York: Routledge.

Singh, P., & Ellerton, N. F. (2012). International collaborative studies in mathematics education. In M. A. Clements, A. Bishop, C. Keitel, J. Kilpatrick, & F. Leung (Eds.), *Third international handbook of mathematics education* (pp. 806–839). Dordrecht, The Netherlands: Springer.