

MERGA: A Community of Practice

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The notion of *community of practice* (Lave & Wenger, 1991) has been very influential over recent years. The focus of mathematics education researchers has been mainly on local communities of practice in schools and classrooms. In contrast, this paper provides an insider perspective of MERGA as a community of practice constituted by a group of researchers who together create, share, and apply knowledge. An examination of the 1994 (Bell, Wright, Leeson, & Geake) and 2003 (Bragg, Campbell, Herbert, & Mousley) conference proceedings and the current MERGA Review (Perry, Anthony, & Diezmann, 2004) traces the changing priorities, focuses, styles and values of the MERGA community.

The notion of “communities of practice” (Lave & Wenger, 1991) is a major focus of mathematics education reforms, both within Australasia and internationally (Forman, 2003). The practices and culture of the classroom community have become central factors informing the study of learning processes. For example, Goos, Galbraith, and Renshaw’s (2004) ongoing research program explores the establishment of a community of practice within which “students learn to think mathematically by participating in the intellectual and social practices that characterise the wider mathematical communities outside the classroom” (p. 112). Successful mathematical communities of practice, Sfard (2003) argues, provide “an environment in which the child is respected, feels free to speak her or his mind, can succeed on her or his own terms, and has the same chance as anyone else to be creative and make a substantial contribution” (p. 382).

Parallel to these explorations centred on the culture of learning practices, I would like to use this occasion to consider the nature and role of MERGA—positioned as a community of practice. Wenger (1998) argued that the ubiquitous nature of communities of practice within our wider society means that they are too rarely the focus of attention. The perspective I offer is not based on a position of senior executive member or a founding member. Rather, it is informed by my personal experience of being a member of MERGA for the last 10 years, my recent role as an editor, with Bob Perry and Carmel Diezmann, of the current MERGA Review and my role as an Early Career Award judge for several years. My position is further informed by the analysis, completed with Margaret Walshaw, for the MERGA Review chapter *Research Trends in Mathematics Education*.

Based on these experiences I want to examine the changing priorities, focuses, styles and values of the MERGA mathematics education community. First, I will discuss the notion of a MERGA as a community of practice. Then I will explore the “what”, “how” and “with whom” in relation to our research practice—with specific reference to papers presented at my first conference in 1994 and my most recently attended conference in 2003. I readily acknowledge that as a single voice, my experience is unique—reflecting my individual identity and position. Thus the view that I offer should not be regarded as a ‘typical’ or ‘representative case’ but as an account that is tested by the extent to which it is “recognised” (Walkerdine, 1990, p. 196) and can be used by the each of you to re-inspect experience. It is hoped that such an account will cause others to reflect on their own position and role within the community of practice afforded by membership of MERGA and be useful to each of us as we contribute to the future directions and practices of the community.

Communities of Practice

Whilst we are most familiar with applying the notion of communities of practice to classroom settings, recently Wenger, McDermott, and Snyder (2002) argued that organisational knowledge can be best organised through communities of practice. In such situations communities of practice are described as:

groups of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis. ... These people don't necessarily work together every day, but they meet because they find value in their interactions. As they spend time together, they typically share information, insight and advice. They help each other solve problems. They discuss their situations, their aspirations, and their needs. They ponder common issues, explore ideas, and act as sounding boards. (p. 4)

Examples given by Wenger et al. include soccer moms and dads who share insights about the art of parenting, artists who congregate in studios to debate the merits of a new style, and gang members who learn to survive on the streets. I would venture to add MERGA members who met conferences.

But to be a community of practice Wenger and colleagues suggested that more than the gathering of people in the one place to discuss common issues is needed. Communities of practice are *learning* communities in which the discourses and practices of that community are negotiated by all the participants; members become informally bound by the value that they find in learning together. In the near term, participation in MERGA provides a forum for expanding skills and expertise, network opportunities for keeping abreast of the field, possibilities for enhancement of professional reputation, and quality assurance. Conference participation involves both a focusing and broadening of one's ideas through preparation of papers and collegial discussion (Begg, 2000). However, this value is not merely instrumental for one's work; it also accrues in the personal satisfaction of knowing colleagues who understand each other's perspectives, a sense of belonging, and a strong sense of professional confidence and identity. Thus, collectively participation in the community should result in developing new perspectives, practices, and approaches.

“What?”

If MERGA as a community of practice is a knowledge-based social structure then “what” is the focus of that practice and how has it changed over the last 10 years? To analyse the domain of research—the topics and issues as typified by MERGA conference presentations—I have extended Walshaw and Anthony's (in press) analysis of research trends over the last 4 years to include a parallel analysis¹ of the 1994 MERGA conference proceedings (Bell, Wright, Leeson, & Geake, 1994).

The areas of research interest as represented by MERGA papers can be usefully grouped into two intersecting groups: mathematics content and educational issue. While traditionally mathematics education research has had a distinct mathematical focus, present-day interest in socio-cultural theory has resulted in a considerably broadened

¹ Analysis includes all papers associated with Australasian research or researchers. See Walshaw and Anthony (in press) for more details about the analysis procedure.

research inquiry centred on social and cultural issues related to learning and pedagogy (Atweh, Meaney, McMurchy-Pilkington, Neyland, & Trinick, in press).

Surveying the papers for an explicit focus on mathematical content areas revealed that 48% of MERGA papers in 1994 had substantial mathematical content as their focus, compared to 44% of papers in 2003. When these papers were further analysed by mathematics areas, guided by those categories developed by Hanna and Sidoli (2003) and Lerman, Xu, and Tsatsaroni (2002) in their independent profiles of *Educational Studies in Mathematics* articles, a change of focus was evident. Comparisons in Figure 1 show that the content focus has shifted from problem solving and algebra in 1994 to favour research on number and computation in 2003. Much of the current research on number appears to be both informing (e.g., Jacob & Willis, 2003) and informed by (e.g., Mitchelmore & White, 2003) the development and implementation of large-scale systemic numeracy programs.

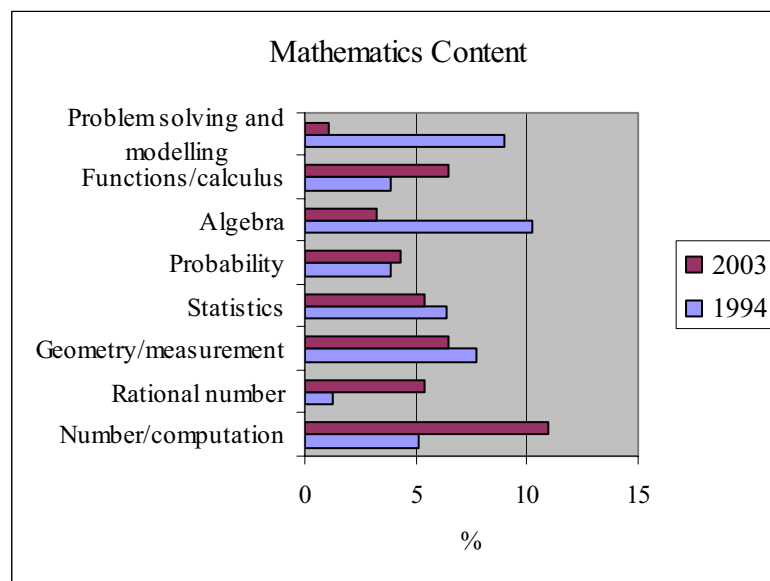


Figure 1: Mathematics content of MERGA papers in 1994 and 2003.

When the papers are analysed by educational issue one finds comparatively little change over the period in question for most categories (see Figure 2). Cognition, the largest category for both years comprised those papers focused on learner effects, including visualization, problem solving and thinking practices associated with mathematical content. The decrease in papers focused on cognition in 2003 is offset by an increased focus on technology, affect, and sociocultural issues.

The increased research focus in the sociocultural area represents a “healthy growth in issues as well as theoretical developments” (Atweh et al., in press). In 1994, sociocultural studies were principally focused on language (e.g., Clarkson, 1994) and gender (e.g., Forgasz, 1994). An exception to this was Zevenbergen’s (1994) critical ethnography aimed at “deconstructing the discourses and practices within mathematics education that could be seen to be contributing to the construction of social differences within the field” (p. 718). This study foreshadowed the advances and diversification in theoretical perspectives and research topics that would follow in the next 10 years.

Significant reporting of cultural research studies was a feature of 2003 MERGA papers. For example, concerns about the social cost of Indigenous students' failure to achieve comparable results in mathematics were evident in a range of presentations. Adam (2003) described the implementation of an ethnomathematical unit in a mathematics classroom in the Maldives.

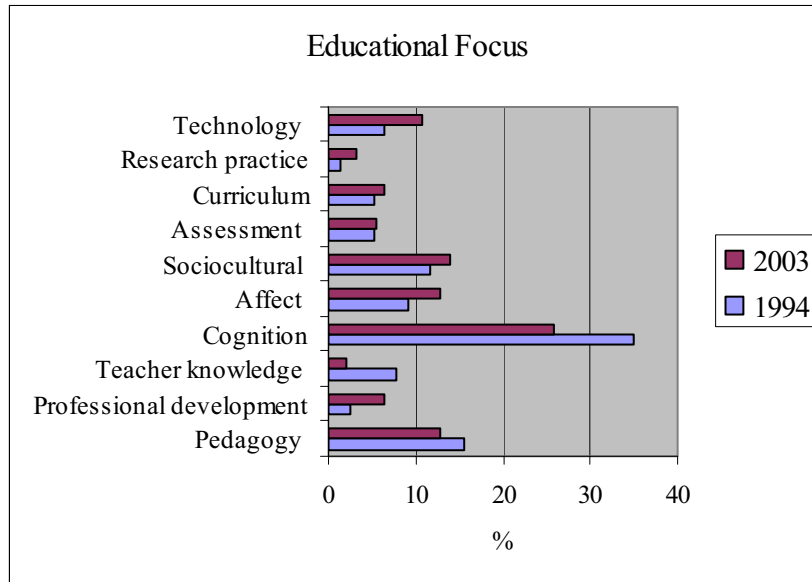


Figure 2: Educational focus of MERGA papers in 1994 and 2003.

When the papers focused on teachers' knowledge, practice and development are grouped together there is remarkable consistency: 26% in 1994 compared to 22% in 2003. However, there are differences within the focus of these categories. The two professional development papers from 1994 are both position papers: Begg (1994) discussed implications of Total Quality Management and Clarke and Hollingsworth (1994) examined alternative conceptions of teacher "change". In contrast, in 2003, research on professional development was principally concerned with teacher change in action. In line with drives towards improved numerical literacy, several of these studies involved implementation of systemic numeracy programs. For example, Perry and Fulcher (2003) considered the sustainability of the *Counting On* program and Keast (2003) reported the journey of one teacher from the *Early Years Numeracy Project*. Aspects of teacher education programs (Smith, 2003) and the *Lesson Study* program (White & Southwell, 2003) were also examined. Contrasting the increased focus on teacher professional development in 2003 was the decline in reports on teacher knowledge, from 8% in 1994 to 2% in 2003.

Alongside an increase in popularity of papers concerning technology—from 6.5% in 1994 to 11% in 2003—was a change of focus. The focus "shifted from investigating the effectiveness of computer-based approaches to teaching specific topics such as algebra and calculus, towards considering how technology can more generally support higher order thinking processes such as visualisation, conjecturing, and justification" (Goos & Cretchley, in press).

“How?”

The field of mathematics education research has changed over time: The last decade has seen shifts from the heavy reliance on theories and constructs borrowed from psychology to sociological constructs and perspectives (Atweh, Forgasz, & Nebres, 2001). In 2003 approximately 60% of conference papers provided explicit information about the theories they used; other papers provided only hints of their frameworks. The most notable feature was an increase in the use of social theories (including social constructivism, Vygotskian theories, and sociology). Alternative accounts of the dominant cognitive and sociocultural perspectives included poststructuralism and enactivism. An increased awareness of the role and diversity of theoretical positions is particularly evidenced in those papers in 2003 that offered critical debate. For example, with reference to the *Mathematics Enhancement Project*, Barton (2003) advocated for the necessity of a coherent and consistent theoretical approach. However, instead of adopting a single theoretical perspective Barton proposed a framework based on the adaptation of three theoretical approaches associated with Cultural Conflict, Critical Mathematics Education, and Didactic Contract. In order to re-vision the curriculum, Neyland (2003) proposed using a lens provided by the “jazz metaphor” as an alternative to the ‘forensic metaphor’ and the ‘cult of expertise’ more traditionally associated with science. In her examination of the use of open-ended tasks Zevenbergen (2003) drew on social theory and Bernstein’s construct of pedagogic relay.

An alternative way to capture the changes in theories that have influenced the community was to note the frequency of citations. In 1994 just over 10% of papers referenced Von Glasersfeld’s and Cobb’s writings on constructivism, Biggs and Collis’ SOLO taxonomy, McLeod’s research on affect, and Schoenfeld’s research on problem solving and metacognition. In contrast, only Cobb was cited in more than 10% of the 2003 papers. However, a wide range of socio-cultural theories as advanced by Lave, Bishop, Sfard, Boaler and Wood were regularly cited.

Although it was noted that descriptions of the research methodology were more detailed in 2003 when compared to those of 1994, categorising MERGA papers by research methodology was fraught with difficulties. In expanding from the traditional quantitative and qualitative descriptors that were used in earlier research, and indeed for some papers in 1994, those categories most commonly cited in recent years have been selected (see Figure 3). Because of the multiplicity of descriptors it was necessary in some instances to band together studies into broad-based categories. For example, ethnography and case study are grouped, and design experiment is an overarching category used to capture those studies that involved “both ‘engineering’ particular forms of learning and studying those forms of learning within the context defined by the means of support them (Cobb, Confrey, diSissa, Leher, & Schauble, 2003, p. 9). Included in this category were studies that engaged teachers in collaboration with researchers, classroom action research, and teaching experiments.

Over the 10-year period the dominance of ethnographic/case and task assessment type studies was sustained. However, within that dominance, the proportion of empirical research reports that claimed to use an ethnographic or case study approaches increased from 20% to 34%. An increase over the 10-year period was also noted in those studies that identified themselves as survey based. A corresponding decrease in experimental studies from 11% in 1994 to just 2% in 2003 is also noteworthy.

The proportion of task-based studies decreased from one-third in 1994 to a quarter in 2003. However, in both years, task-based studies were used to explore a wide range of

issues. For example, Young-Loveridge and Taylor (2003) explored students’ perceptions of the importance of the “right” answer; Way (1994) confirmed the presence of three distinct development stages in children’s probabilistic thinking.

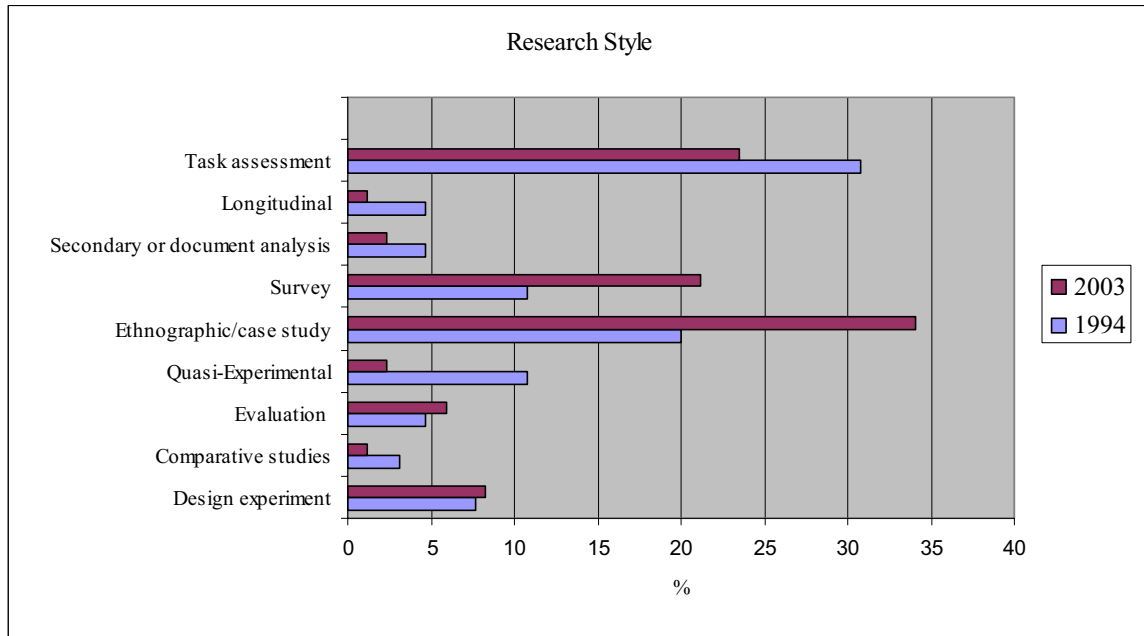


Figure 3: Research style of MERGA papers in 1994 and 2003.

In line with nation wide focus on numerical literacy, the majority of evaluation studies in 2003 involved numeracy projects in primary schools (e.g., Callingham, 2003). Interestingly, in 1994, Wright, Cowper, Stafford, Stanger, and Steward reported progress on their 4-year *Mathematics Recovery Project*, begun in 1992, that was to lay the foundations for the current numeracy initiatives in NSW, Australia, and New Zealand.

Surprisingly, given the repeated calls for classroom focused research and collaborative partnerships (Malone, 2000) the proportion of studies grouped as ‘design experiments’ is relatively constant. However, a notable difference can be seen in the proportion of studies that involved the teacher as researcher: In 1994, Klein’s study provided a rare example of an action research study involving the researcher’s own practice in pre-service teacher education. In 2003 an exemplary study by Smith, with a similar objective of improving teacher education from the insider perspective, was guided by Wenger’s (1998) notions of community of practice. Additionally, 2003 conference proceedings showcased several studies involving teachers as researchers. For example, Vincent (2003) investigated the engagement of deductive reasoning amongst students and the part feedback played in her researcher-as-teacher practice.

Because of space limitations a full discussion on the forms of data collection and analysis is prohibitive. Grounded theory approaches and related use of software packages such as SPSS, NUD*IST, Quest and NVIVO, while relatively rare in 1994, were more common place in 2003. Linked to the greater proportion of experimental studies in 1994, statistical analysis was used in 25% of the empirical studies compared with 8% in 2003. However, the sophistication of the statistical analysis packages suggests that there is still an important role for quantitative research methods courses in graduate programs.

“With whom?”

Alongside the theoretical perspectives we draw on, “contextual factors influence analyses and are fundamental to findings” (Jaworski, p. 1, 2004). Thus, the context of the research is another important piece of the picture to consider—where does the research take place and who is involved? An examination of context might reveal where the expertise of the research community is located as well as provide an understanding of the sites to which access for research is granted. Using the categories described in Walshaw and Anthony (in press) the papers were distributed by level of schooling (see Figure 4). Those studies that involved multiple sectors were double coded.

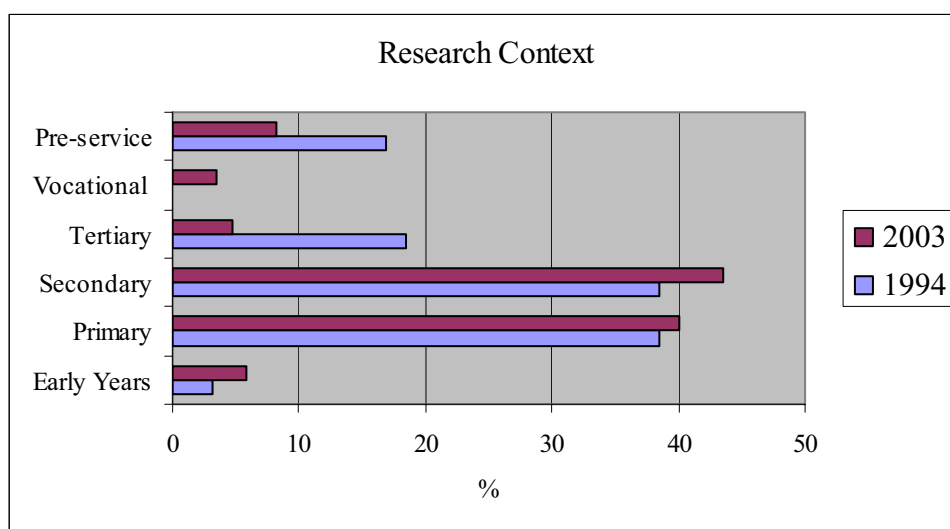


Figure 4: Research context of MERGA papers in 1994 and 2003

Research within schools was evenly divided between the primary and secondary sectors and the relatively stable proportions in the years under review is a feature. There is, however, a noticeable decrease—from the high levels in 1994—of the proportion of papers that relate to the tertiary sector. The scarcity of research in the tertiary sector was noted in the previous and the current (Wood, in press) MERGA Review. Hence one suspects that the downward trend to report studies involving tertiary contexts at MERGA conferences is an enduring one. Early years research is clearly another sector that is under represented at MERGA conferences. Perry and Dockett (in press) noted that research associated with numeracy research contributed to the bulk of the research studies in early years; research in the pre-school context was relatively absent.

Other changes in context include the appearance of studies involving the vocational sector. Zevenbergen and Zevenbergen (2003) explored both young and older people’s views on numeracy in the workplace, and Alanguí (2003) provided an account of an ethnomathematics study on the practice of stone walling among the Kankana-ey people of northern Philippines.

Within the various contexts, research studies involved a range of participants: students, teachers, or people from the wider community. Analysis of the 1994 and 2003 papers by participant groups (see Figure 5) show very similar patterns. Students were, and continue to be, the main focus of data collection. For the most part student data were obtained from questionnaires or task assessments, frequently in conjunction with interviews. In both of the years under review, relatively few studies explored student interpretations about

learning mathematics: Anthony (1994) and Frid (1994) used video stimulated recall of classroom episodes to explore students' learning strategies and metacognitive beliefs. Still nearly a decade later, Walls (2003) reporting on her 3-year ethnographic study of children's expanding awareness of mathematics and their growing mathematical identity, argued that the findings provided "a much-needed 'voice' for the child's lived experience of mathematical learning" (p. 710).

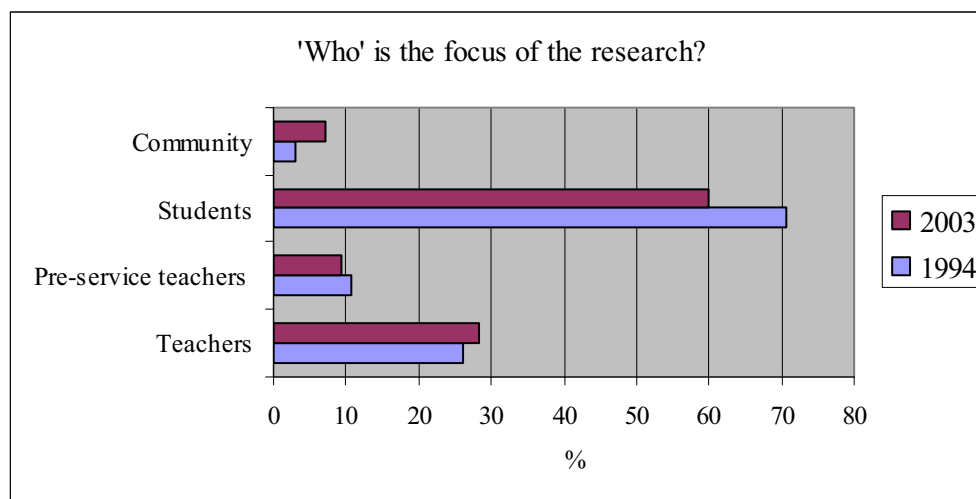


Figure 5: Participants involved in MERGA research in 1994 and 2003.

Current and Future Directions for our Community of Practice

As in any community in which the practice is constituted by the participants we can expect over time changes in our shared ways of behaving, our language, our habits, our values, and tool-use (Winbourne & Watson, 1998). Wenger et al. (2002) claimed that as communities mature the community emphasis should change from defining to developing their domain.

Identifying knowledge gaps can be a very healthy process. It can induce a more honest discussion of a community's needs and build identity as members develop new areas. ...In this way the community's learning agenda continually evolves. (p. 99)

Chapter authors in the current MERGA Review all identified pockets of the domain that remain under-researched and under-theorised. For example: Wood (in press) noted that tertiary research, often conducted by mathematics lecturers, tended to look closely at the 'student problem' while rarely interrogating the lecturers' own practice and beliefs; Pfannkuch and Watson (in press) noted a need for studies addressing adult statistical literacy; and Diezmann, Faragher, Lowrie, Bicknell, and Putt (in press) noted the limited research literature on exceptional students. An over-riding concern was that despite advances in our research capability and increased focus on socio-cultural issues, there remains the interminable challenge "to provide equitable mathematical access to all children irrespective of culture, ethnicity, gender, economic and social position" (Jones, in press). According to Atweh et al. (in press) research concerning the area of student disadvantage "needs to move from identifying factors of disadvantage into considerations of solutions to problems". In a similar vein, Schuck and Grootenboer (in press), in relation to affective issues, suggested that we "need to engage in research studies which offer substantive interventions which enhance attitudes, and interrupt those beliefs and values that do not promote effective mathematical teaching and learning".

Wenger et al.'s (2002) also cautioned that communities of practice can suffer disorders when some aspects of communities are functioning too well. For example,

in a tight community a lot of implicit assumptions can go unquestioned, and there may be few opportunities or little willingness inside the community to challenge them. The intimacy communities develop can create a barrier to newcomers, a blinder to new ideas, or a reluctance to critique each other. Like many human weaknesses, community disorders are frequently an extreme version of a community's strength. The very qualities that make a community an ideal structure for learning—a shared perspective of a domain, trust, a communal identity, long-standing relationships and established practice—are the same qualities that can hold it hostage to its history and its achievements. The community can become an ideal structure for avoiding learning. (p. 141)

As such, our community of practice must offer a place of exploration where it is safe to speak the truth and ask hard questions. On some occasions, chapter authors (e.g., Anderson & White; Vale, Forgasz, & Horne, in press) noted contradictory findings across reviewed research studies. There is a danger that small-scale investigations which are never followed up through replication type studies which test, extend or challenge their findings, inevitably produce inconclusive and contestable findings of little long-term practical relevance. Meta-analyses of previous research that combine the work of a wide range of researchers may be an alternative approach. For example, Doig, Groves, and Mulligan (in press) argued that meta-analyses of the many numeracy studies might well prove to be another productive form of collaborative research. The need for more longitudinal or large-scale, system-based initiatives, was also noted within several chapter reviews (e.g., Atweh et al.; Schuck & Grootenboer; Walshaw & Anthony, in press). Doig et al., in reference to number research, contend, however, that “it is critical that we do not neglect pure, basic research linked to student learning”. Clearly, we need a balance between large-scale research, which contributes directly to policy, and small-scale research that creates knowledge and that can form the basis for future policy initiatives.

In several instances reviewers highlighted occasions when innovative methodologies have led to new advances in the field (e.g., McDonough (2002), Smith (2003)). Southwell, White, and Klein (in press) suggested that the beginning of the new millennium is a good time to “seek out emergent and perhaps contentious research paradigms”. The continued need to trial and evaluate new methodologies is an important element of our practice and efforts within MERGA conferences to include workshops and papers that debate and inform research methodologies is to be applauded.

Because of the complexity of the practices involved in teaching and learning mathematics we also need to engage in critical debate and dissemination about the value of exploring the use of a wider range of theoretical frameworks within our research. According to Jones (in press) research programs that build and critique theory over a series of studies are vital to our practice: “this kind of theory building over a sustained period is one of the features that sets, [for example] MacGregor and Stacey's research apart from some of the other Australasian studies published in national proceedings and journals”. In order to advance our community of practice we also need to explore accounts from multiple theoretical lenses and perspectives (English, 2002). An excellent example of the interdependency of theory and research findings is provided by Even and Schwarz (2003). In their paper they exemplify how analyses of a single lesson from two different theoretical perspectives—cognitive and socio-cultural—lead to different interpretations and understandings of the same lesson. Opportunities such as MERGA round table and Special Interest Group discussions may go some way to enhancing such productive exchanges.

An important aspect of our community of practice is the “addressees” of our research. Lerman, Xu, and Tsatsaroni's (2003) analysis of PME papers provides an interesting

model that might usefully be applied to our proceedings at some later date. With reference to PME papers, Lerman et al. note how few articles are addressed to policy-makers, speculating that this may indicate that “research activity rests on and helps to reproduce a given power structure”. Warren and Pierce (in press), in reference to their review of algebra research, concluded that curriculum developers, text book writers and classroom teachers need to take cognisance of many of these findings. In this regard, those MERGA members that regularly contribute to the production and articles within the likes of *Mathematics Teacher*, *SET*, *Australian Primary Mathematics Classroom*, etc. must be commended.

Boaler (2003) claims, however, that we need to do more than communicate findings; we need to transform findings into records of practice and create opportunities for teachers to conduct their own inquiries within records of practice. In relation to the persistent research/practice divide several MERGA Review chapters called for improved articulation of research that encourages teachers to see the “value of changing from more traditional to contemporary practices” (Anderson & White, in press). Forster, Flynn, Frid, and Sparrow (in press), in their review of technology, noted that those teachers who allowed researchers into their classrooms together with the practitioner-researchers are leading changes in the way teaching is thought about. Greater use of participatory research designs, Atweh et al. (in press) argued, would not only lead to better research but also to more useful research.

Teams of researchers and teachers with different perspectives need to work together developing new research questions, enhancing extant methodologies and complementing their analyses of data rather than engaging in a consensual reduction that reduces the potency of the data. (Jones, in press)

Strengthening the level of collaboration between researchers, teachers and policy makers will require monitoring these changes in our practice.

In addition to a strong bond of communal competence Wenger (1998) noted that a well functioning community of practice requires a deep respect for the particularity of experience and a sense of trust. Perry and Dockett (in press) referred to the “multitude of different protocols and acceptances, which are necessary to research with Indigenous people”. Clarkson and Atweh’s (2003) study on MERGA members’ perceptions of globalisation suggested that opportunities to experience at depth non western cultures is linked to deeper appreciation “of the issues thrown into relief by the notions of globalisations” (p. 244). Pfannkuch and Watson (in press), in reference to statistics research, claimed that “the lack of collaborative groups working on such projects may be stifling innovation and the effectiveness of Australasian research”. While cross collaborative research was evident in several of the 1994 and 2003 MERGA papers, collaboration between New Zealand and Australian researchers was relatively absent. Perhaps the collaborative efforts represented in the current MERGA review will provide a stimulus in this area?

In accord with the increase in reflexivity in mathematics education research, our community should take time to examine itself. This somewhat sketchy examination of “what” and “how” and “with whom” we develop our practice demonstrates that as a community we are a changing and vibrant group. From my own perspective, MERGA has indeed fulfilled Wenger’s (1988) claim to be a living context of learning:

a context that can give newcomers access to competence and also can invite a personal experience of engagement by which to incorporate that competence into an identity of participation. On the other hand, a well functioning community of practice is a good context to explore radically new insights without becoming fools or stuck in some dead end. A history of mutual engagement around

a joint enterprise is an ideal context for this kind of leading-edge learning...When these conditions are in place, communities of practice are a privilege locus for the *creation* of knowledge. (p. 214)

Within our community individual members contribute to the formation of the community norms, values and practices even as the community exercises its influences on the participating individual. At the very least we each need to think how we can contribute to MERGA—a community of practice—so that our research makes maximum impact where it is most needed.

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