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Some Problematics in International Collaboration in Mathematics Education¹

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This paper discusses data from interviews with mathematics educators from Australasia and Colombia on their views of, experiences in and expectations from the internationalisation and globalisation of their discipline. International collaboration is essential for moving the discipline forward in a globalised world and avoiding the colonialism of the past - and allowing the discipline to play its role in bridging the increasing gap between developing and developed countries. The aim of this analysis is to examine some problematical aspects of this collaboration between countries of unequal "power" and resources.

In a previous publication (Atweh & Clarkson 2001b), we argued that mathematics education is perhaps the most internationalised subject in higher education. This is evidenced by both the similarities on curricula around the world and the number of international organizations, conferences, journals and handbooks in the discipline. However, there has been very little research which examines their causes and effects on the different players in the global scene. In particular we drew attention to some voices from developing countries calling for increased collaboration with developed countries, even to the extent of "a global minimum curriculum below which no continent should be allowed to drift, however under-developed" (Kuku, 1995, p.407). On the other hand, few voices from developed countries have expressed great concern about the effect of international exchanges of the past and their effect on developing countries. In the words of a leading mathematics educator in Australia with a notable reputation and international experience:

Over the past 20 years I have often had cause to reflect that it is Western educators who were responsible not only for getting their own mathematics teacher education equation wrong, but also for passing on their errors to education systems around the world. (Clements, 1995, p.3)

Both these views were expressed in an ICME regional conference on regional collaboration in mathematics education. Arguably, these specific views may be contentious and perhaps not widely shared within the mathematics education community in their respective regions. However, as we argue in the previous publication, these differences of voice from developed and developing countries do point to the need for further research and dialogue around the world between educators from developing and developed countries about the aims, processes and outcomes of international exchanges in the field.

In another conference paper (Atweh & Clarkson, 2001a) we discussed the issue of a "global curriculum vs. global collaboration" in mathematics education. We have argued that while a global curriculum may be an anathema to many mathematics educators, global collaboration is essential for moving the discipline forward in this globalised world - at the same time avoiding the colonialism of the past - and allowing the discipline to play its role in bridging the ever-increasing gap between developing and developed countries.

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This paper discusses data from two focus group interviews with leading mathematics educators - one conducted with educators from Australia and New Zealand and the other conducted in Colombia in Latin America.² The aim here is not to compare and generalize the understandings, concerns or experiences of educators from the two regions. Rather, the discussion of the two interviews is intended here to highlight some problems and issues regarding international collaborations between privileged and less privileged countries.

Methodology

This part of a two-year study consisted of the conduct of focus groups (Morgan, 1997; Vaughn, Schumm, & Sinagub, 1996).³ The focus groups were conducted in Australia, Brazil, Mexico and Colombia. In each case the local organizers of the focus groups were requested to invite leading mathematics educators in their countries with substantive international contacts and experiences to participate in the groups. The focus group discussions lasted between one and two hours each and comprised between five and ten educators. Prior to the focus group, the participants received a short summary consisting of some definitions of terms used and some issues that they may want to address. A major characteristic of focus groups is that they allow participants to raise issues that are important to them rather than address the questions posed by the researchers. From time to time, the researchers asked some clarifying questions and directed the discussion to move on to other topics. The languages of the participants were used in the discussion paper and in the focus groups. The discussions were transcribed, translated into English where applicable, and the translation confirmed by a second native speaker of the language. The transcripts will be sent back to the participants to check its accuracy and to suggest any alterations and additions that they would like to make. The analysis used here will be restricted to the interviews conducted in Australia⁴ and Colombia.

Findings

Colombian Context

In the background report of a World Bank project targeting higher education in Colombia (World Bank, 2002), the report states that the country is experiencing its worst economic performance in over 60 years, and this has been compounded by ongoing internal conflicts. Growth in GDP decreased from an average of 4.5% during the first half of the 1990's to -4.5% in 1999. In 1998 the GDP was AUS\$205b (UNSD, 2002). In spite of showing signs of economic recovery, the increase in unemployment and poverty arising from the economic crisis and high structural unemployment continue to pose serious threats to the welfare of the poor and vulnerable. With a current population of just under 43 million people, unemployment reached an all time high in 2001 of just over 20%, almost double the traditional rate of 11 percent. The National Planning Department estimates that enrolment of 7-11 year old children from the poorest families declined from 87.3% in 1996 to 83.2% in 1998 and the enrolment rates of 12-17 year olds fell from 66.3% to 64%.

² This is part of a project funded by the Australian Research Council on Internationalisation and Globalisation of Mathematics Education.

³ Later stages of the project will involve surveys and case studies.

⁴ The Australian interview consisted of Australian and New Zealand participants. Hence we will refer to the interview as the Australian interview and to the participants as Australasian educators.

Higher education, which had been expanding throughout the 1990's, also has seen a reversal in its growth. Beginning in 1998, and continuing until the present, the number of new entrants to tertiary education is declining. The coverage rate⁵ currently stands at just 15% which compares unfavourably to other countries in the region and to the OECD country average of 54 percent. Public institutions have increasingly shifted their revenue base towards cost-recovery where 49% of revenues came from students as of 2000. As a consequence, the number of entrants into tertiary education declined by 19%. Private providers enrol more than 2 out of 3 students. This makes the higher education sector in Colombia far less accessible, and hence, far more inequitable than ever before. Only 192 students were enrolled in Doctoral level studies in the country. The quality of the teaching in higher education was also highlighted as a matter of concern. While there has been a gradual phasing out of academic staff with less than 4 years of tertiary education, the share of faculty members with doctoral degrees still remains at 2 percent. Finally, the report concludes that the quality of research is at risk, and generally, the quality of programs are insufficient to support the internationalisation of Colombian higher education.

Selected Views of Colombian Mathematics Educators

While many Colombian universities have developed policies expecting that lecturers be involved in research as well as teaching, the reality is that resources at universities are extremely limited for the conduct of research. With the country in economic crisis, education is not high priority for governmental spending. Similarly, with declining funding, universities do not dedicate resources for research. Extended teaching hours for staff allow little time for research. Research and publications are not seen by the academics as rewarding when it comes to employment and promotion. Research activities are often the initiative of individual researchers who, in most cases, use their own private resources to conduct research. Of the nine lecturers involved, there was a single doctorate holder. In the 1990s a few academics from the country were successful in obtaining scholarships for undertaking doctoral programs at overseas universities (Colombian focus group, p.19). In the mid 1990s, as a result of collaboration between five private and public universities in the capital Bogotá and some regional cities, a national doctoral program in science and mathematics education was commenced in the country. By the end of the decade, such a program was seen to be too expensive for the universities involved and was put under review putting its future under threat (Cardenas, 2001, private communication). Private universities in the country tend to be more entrepreneurial and they raise some of their own funds for research. Obviously in countries such as Colombia this is not an easy task to say the least (Colombian focus group, p.20). When asked what their expectations were from international contacts, the participants in the focus group were very direct and candid in their reply. They aspired for more internationally financed research or at least co-financed research projects. One academic gave an example of a research project between Argentina and Mexico and Colombia. The project was planned and financed from outside and the data was gathered from the three countries. Not only did it provide funds for the conduct of the research but also it provided some professional development in research for the involved Colombian educators.

⁵ Total enrolment in a specific level of education, regardless of age, expressed as a percentage of the official school-age population corresponding to the same level of education in give school year.

The major themes that arose from this interview were a sense of isolation, a feeling of difference from other countries, and a lack of reciprocity in their international contacts. The country has very limited up to date resources in mathematics education. Internet access is rather recent, very limited and not always reliable. However, its introduction was seen as highly rewarding for staff for giving a chance to realize that "we are not alone" (Colombian focus group, p.3) in facing educational problems in the mathematics classroom.

The country was not seen by the participants as ready for full participation and competition on the global scene. This was attributed partly to government policies that do not reflect a great value in higher education or a commitment for the use of education as means of achieving social justice (Colombian focus group, p.6). The lack of recognition of the country's degrees overseas implied to them that they were not preparing their students for a globalised world (Colombian focus group, p.7).

Colombia mathematics educators operate in a globalised world with a sense of lack of reciprocity and a limited ability to "exchange" with overseas countries on equal terms. Hence, few educators hesitated to use the terms internationalisation of mathematics education in their context (Colombian focus group, p.11). One academic made the distinction between "copying" and "appropriating" ideas from outside the country. The former means of international exchange was seen as more dominant in their situation and as a form of colonialism. To be fair however, these views were not shared by everybody in the group. Another academic referred to the past reforms in mathematics education that occurred in the country as the labour of local educators working autonomously.

At times, ideas from outside constituted "fashions" that were uncritically accepted locally. These mathematics educators did not feel that they have developed "counter arguments or proposals " (Colombian focus group, p.16) for balancing these fashions. At times, the changes were introduced so rapidly with insufficient time and resources to evaluate their appropriateness for the local context. Further, the exposure to outside ideas was seen to be highly selective. With limited direct access to international publications and conferences, exposure to overseas ideas tended to be limited by the overseas destinations of doctoral candidates and/or by the language of publication - in this case Spanish.

For some of the participating academics, internationalisation is associated with the exchange of "scientific knowledge and technological advances that knows no geographic boundaries" (Colombian focus group, p.5). Perhaps better saying the only boundaries knowledge knows are the economic capacity of the different countries for its generation and the enjoyment of its benefits. Hence, the similarity of mathematics programs around the world was seen by some as emerging from the very nature of mathematics itself (one educator calls it universal mathematics, Colombian focus group, p.12). One educator put it this way: "definitely it is impossible to have a different program in arithmetic for the first years of school. The differences [between curricula around the world] may be the methodological approaches or [sequencing of topics]. I think this [is true] because of the character of mathematics" (Colombian focus group, p.9).

However, at least one educator is not convinced that internationalisation of mathematics curricula is a result of the nature of mathematics itself. He gives the example of the introduction of calculus in the education system in the United States based on the need to create and maintain a technological society. However, calculus was also introduced in the Colombia that does not have the same needs because it imports technology rather than produce it. Hence, he argued that there must have been other factors that determined its adoption in Colombia (Colombian focus group, p.13). Others attributed the global

patterns in the curriculum to the patterns of colonialisation of Latin America and Colombia in particular in the past hundred years (Colombian focus group, p.10).

The Australian Context

In 2001, the Australian population of 19.5 million was nearly half of that of Colombia. The current GDP index is increasing at a rate of 4.5% per annum from AUS\$745b in 1998 (roughly 4 times the Colombian figure) (United Nations Statistical Division, 2002). In the 1990s, funding in higher education has significantly changed in Australian universities with the introduction of user-pay schemes and a reliance on self funded overseas students. The table below illustrates a decrease in the percentage of public spending on higher education and an increase in fees and charges and in Higher Education Contribution Scheme (HECS) (based on data from DEET, 1999). The increase in fees and charges is due mainly to overseas students and full fee paying students studying at higher degrees. The increase in percentage in HECS is due to an increase in student population and higher rates paid by the students. In a relatively affluent country such as Australia, these increases in rates of contribution are not translated into a decrease in number of students as is the case in Colombia.⁶ For example, data from the Department of Education, Science and Training (DEST, 2002) show that between 1991 and 2000 the total number of domestic higher education students rose by 20%. In 2000 there were 695,485 students enrolled in universities (3.6 of total population representing 76% of the specific age group). Of those 20% are enrolled in higher degrees including 5% as postgraduate research students. Of these, 13.7% are overseas students. In 2001 there were some 95,607 overseas students enrolled in Australian universities who come from 100 different countries. Approximately two thirds of these students come from the Asian region. Between 1991 and 2000 the total number of international students in higher education students rose by 220% (DEST, 2002).

	1995	1999
Commonwealth grants	57.2	48.8
HECS	12.0	19.0
Fees and Charges	11.7	17.7

Selected Views of Australasian Mathematics Educators

In the Australian focus group the participating academics were well aware of the role of their country as a middle player in the international scene. On the one hand, Australian educational and research thinking is significantly affected by ideas received from overseas – mainly from the United States and United Kingdom. On the other hand, Australian mathematics educators were highly active in professional development and in teaching overseas students from a variety of contexts in particular in the Asian region.

These Australasian academics had significant involvement in international scene in mathematics education. The vast majority of them regularly, if not annually, attended international conferences and had easy access to the Internet and many (mainly English speaking) journals in mathematics education. By no means were they passive participants in these international contacts. One academic was on the International Committee of a highly influential international research group in mathematics education. Another was the

⁶ This is not to say that these policies have not had an effect on equity and participation from disadvantaged groups of students.

editor of an international journal of research in mathematics education as well as at least two international books in the field. Three of the others were writers of chapters in international handbooks. Some were organizers of discussion groups and presenters at ICME meetings. At least four spoke of their experiences in consultancies overseas that involved staff and curriculum development in a variety of Asian countries. Almost all would have been involved in teaching international students in Australia and abroad.

The Australasian educators pointed to the role of economic factors in international exchanges both for developing and developed countries. Commenting on the needs of Laos, one Australian mathematics educator asserted that developing nations need assistance from more developed countries because "they want to be part of the world economy ... part of the international scene" (Australian focus group, p.14 & 15). After a considerable time of isolation due to internal politics, Laos is slowly opening to international trends and markets. Another Australian educator pointed out that

the critical part is that there is an ideology out there, that if you take a Western view, whatever that may be, and I think that even within the Western view, it's a narrow American view, that if they take that view of the world then that's what is going to give them access to power ... That is the way they're going to get out of their, in a sense, oppressed state, by [adopting] the American curriculum. (Australian focus group, p.20&21)

These economic factors act differently in developing countries and in developed countries. The Australian focus group discussed the increased reliance of many Australian universities on funds obtained from overseas students. Mathematics educators in both Australia and New Zealand have shown considerable concern about problems that such emphasis on the marketisation of higher education can cause. One educator who has worked with Canadian teacher training students coming to Australia to obtain their qualifications, points out the conflict between the requirements for local registration of teachers in Australia and the needs expressed by the students themselves who aspire to teach in their own home country (Australian focus group, P.23).

Economic factors behind international contacts are not the only ones identified by the Australasian educators. In contrast to the educational marketisation policies of the government and of universities, mathematics educators often expressed more sincere humane and ethical reasons for being involved in international projects of development and research. An Australian educator who is the editor of an international journal in mathematics education as well as an international handbook on mathematics education discussed her efforts to solicit articles and chapters from a wide range of developing countries. Documents from non-English speaking countries often needed more assistance and editing to reach the "standards" set by the publications. She adds

one of my greatest rewards I get from the Journal is working with people who present papers of potential, and working with them over a period of time to get their papers published, and they are eternally grateful for this and they come from many many countries. To me, that is [very] rewarding. (Australian focus group, p.11).

Another educator with extensive work in Papua New Guinea and Laos commented that many mathematics educators are less colonial in dealing with colleagues from developing countries than in the past (Australian focus group, p.17). She discussed the need to be not only more sensitive to the local culture but to really know it and understand it. This she had achieved by living in the country with the people she was working with, learning their language and history and designing programs that were based on what they already had and designed to suit their expressed needs (Australian focus group pp.14-16).

Discussion and Conclusions

While one can argue that international contacts and exchanges in mathematics and mathematics education have existed since the early developments of both disciplines, undoubtedly they have increased in the new age of globalisation and will continue to exponentially increase in the future with further developments in technology, ease of travel and population movements. We do not construct such contacts as necessarily either good or bad. Our research is based on the need to scrutinise the effects of such interactions on the different players. This can only be achieved through deliberate and targeted research, reflection and debate. Further, we argue that such actions need to be done in collaboration between mathematics educators from around the world.

The term collaboration however needs further examination. Hargreaves (1994) argues that "one of the emergent and most promising metaparadigms of the post-modern age is that of *collaboration* as an articulating and integrating principle of action, planning, culture, development, organisation and research" (p.245). In the context of school change which Hargreaves was discussing, he points out the benefits of collaboration, as well some of the dangers the term carries and certain conditions under which it can be most effective and ethical. Here, we make three main points about international collaboration in mathematics education.

First, collaboration between mathematics educators from around the world is particularly problematic when it occurs between players with different agendas and differing access to resources. As we have seen from the two cases examined above, the conditions in some countries around the world make their contribution to international exchanges highly problematic. Their participation in the usual arenas where international contacts and exchanges occur is very limited. A history of colonialism and economic oppression often leads to the silencing of their voices in international debates. Further, one should be aware of the differing economic interests of the different countries in the race for globalisation and international markets. While developing countries may aspire to maintain and improve their standing in the race, developing countries are struggling even to reach the starting line! Arguably, the very metaphor a "race" and the rhetoric of "competitiveness" require careful critique and scrutiny. Not only are they contrary to the metaparadigm of collaboration but also their adoption would lead to further widening of the gap between the rich and the poor making genuine collaboration even more problematic.

Second, one characteristic of the post-modern and globalised times we face is the lack of certainty and an awareness of the complexity of issues. While it may be neither desirable nor possible to establish guidelines for ethical international contacts that apply to all situations, one needs to be aware of the effects and limitations of such contacts both in the near and long term futures. At the same time that we are becoming aware of the politics of difference and local interests, internationalisation is also making us aware of our similarities and global interests. We argue that these should not be constructed as either/or constructs in the traditional positivist logic. What is needed is that all international contacts be self reflective and critical of their processes and effects. Not only should they reflect on the benefits and gains in knowledge by the different parties involved but also on how different parties can be actively involved in developing their own voice and taking increasing control in managing their own mathematics education to achieve their interests. International collaborations between mathematics educators should be transparent,

reflective and accountable in examining their own rationale, aims, processes and outcomes. Questions of voice and power should always be upfront.

Third, genuine collaboration must aim to balance the tension between voice and vision. Hargreaves (1994) argues, "[v]oices need to be not only heard, but engaged, reconciled and argued with. It is important to attend not only to the aesthetic of articulating...voices, but also to the ethics of what it is those voices articulate!" (p.251). International collaboration should aim at developing a shared vision between the different players and realise that the contribution of the different players with differing access to power is problematic. Similarly, these international exchanges should aim to balance the tension between changes in structures and changes in cultures that allow for genuine collaboration. Not only do questions of costs and processes of international exchanges need scrutiny but also the assumptions behind them. Exchanges that are simply based on "helping" developed countries (to become like us?) are often based on paternal colonial assumptions and do not contribute to genuine collaboration. Collaborations should be based on mutual respect and trust in the ability of the different partners to contribute different types of learning to the collaborative enterprise.

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