Towards a Model of Social Justice in Mathematics Education and its Application to Critique of International Collaborations

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Concerns about social justice issues in mathematics education have a long history stemming from research on gender to issues related to ethnicity and social class. However, almost non-existent in this literature is a theoretical engagement with the concept of social justice itself. This paper further develops a model of social justice elaborated in previous presentations based on writings of feminist theoreticians. It posits social justice as a multidimensional and transcategorical construct. Further, it applies the model to a discussion of social justice in international collaborations in the discipline.

Issues and concerns related to social justice are not new in mathematics education. For more than fifty years now numerous researchers around the world have identified factors that may be related to the opportunity to study and achieve in mathematics. Perhaps, historically, gender was the first such identified factor. More recent publications deal with issues of ethnicity and multiculturalism and, perhaps to a lesser extent, socioeconomic factors (Atweh, Forgasz & Nebres, 2001). Much of that research and critique has led to policy changes and changes in practice that have seen the performance of members of certain groups traditionally excluded from mathematics education increasing their participation and achievement in the area. Naturally, this is not to say that the problems of access and achievement are under control, but to acknowledge the achievement of researchers in bringing these concerns to policy and practice levels.

However, a wide review of literature in mathematics education has identified a lack of attempts to engage with the concept of social justice itself. This lack of theoretical engagement has not deterred the changes to policy and practice occurring as argued above. However, I argue that it has diminished the capacity of the various remedies to injustice from becoming self-reflective and self-critical. Perhaps the debate between equal opportunity and the different ways of knowing is a reflection of the need to engage with an understanding of social justice that will allow us to engage in evaluation of the merits and limitations of measures to counteract injustice. This paper is an attempt to deal with the issue of social justice on a theoretical level. It presents a model of social justice that is based on some of the theoretical work of feminist writers such as Iris Marion Young and Nancy Fraser. However to ground the discussion in empirical issues, the use of the model will be discussed in relation to issues of global collaboration that I have addressed in previous publications (Atweh, Clarkson & Nebres, 2003)[2].

Initial Model for Social Justice

In a previous publication, based on theorisation by Young (1990) and Fraser (1995), Atweh and Ragusa (2003) developed a model for social justice as it relates to international collaborations. Young's main critique of traditional conceptions of social justice is that they are based on "having" rather than "doing". Young argues that grounding social justice

[2] The case studies used are based on an ARC Discovery Project funded in 2001 and 2002 in collaboration with Philip Clarkson.

in individual solutions allows little room for consideration of divergent social groups. Hence, extending traditional models based on the distribution of material goods to disadvantaged individuals, to other goods such as self-respect, honour and opportunity for disempowered social groups, is problematic. To understand the struggles for social justice by a variety of groups, such as women, African Americans, and gays and lesbians, feminist theorists created a discourse of social justice based on *recognition*. Fraser (1995) expounds:

> Demands for "recognition of difference" fuel struggles of groups mobilised under the banners of nationality, ethnicity, 'race', gender and sexuality. … And cultural recognition replaces socioeconomic redistribution as the remedy of social injustice and the goal of political struggle. (p. 68)

Fraser argues social justice requires *both* redistribution and recognition measures. Further, she discusses two types of "remedies" to deal with injustice that cut across the redistribution-recognition divide. These are affirmation and transformation. *Affirmative* remedies include those "aimed at correcting inequitable outcomes of social arrangements without disturbing the underlying framework that generates them" (p. 82), while *transformative* remedies are "aimed at correcting inequitable outcomes precisely by restructuring the underlying generative framework" (p. 82). Based on this discussion, Atweh and Ragusa put forth a model comprised of four modes characterising possible collaborations among academics from different cultures.

Table 1
The ADMC Model for Analysing Social Justice in International Collaboration

	Affirmation	*Transformation*
Redistribution	*Mode 1:* Aid	Mode 2: *Development*
	Attributes: Sharing of information and resources among countries. Represents cultural classification based upon access to knowledge. Can generate misrecognition.	*Attributes:* Restructuring of relations of knowledge production. Blurs group identification. Can help remedy misrecognition.
Recognition	Mode 3: *Multiculturalism*	Mode 4: *Critical Collaboration*
	Attributes: Acknowledging cultural differences, such as cross cultural research. Supports group identification.	*Attributes:* Deep restructuring of relations of recognition. Blurs group differentiation.

Before discussing each of the modes of social justice illustrated by this model, two comments about its use are important. First, this model is not intended as a simple classification of the different means of international collaborations. That is, each international activity can reflect one or more of the modes represented here. Instead, the model is presented here to provide us with the language that might prove useful in critically reflecting on many international collaborative activities and contacts. Second, the model does not imply that some of these modes are necessarily "good" while others are necessarily "bad". In applying this model, it is important to recognise each mode possesses the potential to be "good" and "bad". In other words, the model is not intended as moral arbiter, but rather as a heuristic tool designed to augment and facilitate critical thinking. Third, positing the different modes as separate categories is, necessarily, a simplification of

a complex web of modes. Perhaps it is more useful to conceive of the two dimensions as continua rather than discrete categories.

Mode Definitions and Descriptions

Aid type interactions represent the non-critical transference of tactile (e.g., grants) or symbolic (e.g., know how) resources/goods from one social group or individual to another. Industrialised countries contribute significant amounts of funds either directly to non-industrialised nations or indirectly through international aid organisations. Similarly, industrialised countries enjoy relatively high levels of resources and expertise to develop theories and practice in curriculum and staff development and pedagogy. Such knowledge is normally developed in particular and relatively affluent contexts. Through conferences, international publications, and international consultancies, such knowledge is passed onto developing nations and applied in non-industrialised settings with minor, in any, modifications. The intention here is not to argue that these forms of interactions are necessarily destructive, but to point out that they are rarely reciprocal with respect to the responsibilities of the different partners. This lack of reciprocity may lead to the perception that non-industrialised nations are limited in their ability to contribute towards the development of mathematics education. Perhaps, this is an example of what Fraser calls misrecognition. Further, such activities by themselves contribute little to changing the status quo of dependency on the providers of aid.

Development is a transformative process whereby goods and/or knowledge are distributed across social structures, groups and/or individuals in ways that allow for the development of the recipients to enact further developments on their own. Such activities may include forms of international postgraduate studies in more developed countries' programs that are based on professional development of curriculum developers. Such activities may contribute towards the long-term empowerment of professionals from within the disadvantaged cultures to conduct their own research and curriculum development. Also, such development activities seek to change pre-existing patterns and norms of knowledge production and may have short or long-term effects. However, they remain subject to the claim of non-reciprocity identified above and do not necessarily problematise differences in interests and needs of the different participants.

Multiculturalism refers to modes of interactions that recognise and affirm cultural variations. Multiculturalism acknowledges differences among cultures and supports multiple identities. Arguably, the areas of research that best illustrate this principle are ethnomathematics and comparative studies that acknowledge the mathematics and mathematics education of different social groups. Perhaps the current ICMI study on Mathematics Education East and West is an example of such a study that is driven by non-Anglo-European educators (Lueng, 2001). Lastly, the proliferation of regional conferences in mathematics education around the world have contributed to the development of both local knowledge and research as well as local pride of the participating countries. However, multiculturalism is open to the concern that that it remains an affirmative process in that it recognises difference but does not seek to alter/change access to, or production of, material and/or symbolic goods. A similar critique of ethnomathematics was developed by Vithal and Skovsmose (1997).

The *Critical Collaboration* mode refers to activities that, like the multiculturalism mode, aim at giving recognition and respect to the knowledge of the different cultural groups. However, it also attempts to challenge the structures that give rise to inequality in status as well as knowledge between nations. These activities are necessarily based on the

participation of educators from the different cultures in developing their local knowledge as well as contributing to the collective international knowledge. Collaboration is a concept that requires problematisation. Atweh and Clarkson (2002) have identified some requirements for genuine critical collaboration between developed and developing countries. First, collaboration between mathematics educators from around the world is particularly problematic when it occurs between players with different needs and differing access to resources. Hence, participants in global collaboration 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. Second, questions of voice and power should always be up front. Collaboration should be constructed to empower individual countries to be self-reliant rather than to increase their dependency on ideas from more developed nations. 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. Third, 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.

Putting the Model into Action: Two Case Studies

In this section I will apply the theoretical construction of social justice developed above to two case studies in mathematics education to illustrate both the complexities of global collaboration from an ethical and social justice perspective, and the potential of using the multidimensional constructs of social justice developed here to reflect critically on global interactions. The case study relates to an informal collaboration project between researchers from nine countries with differing experience and interest in research. The second relates to an area of research that has attained a global following in mathematics education.

Case Study 1: International Collaboration and Knowledge Networks

The Learners Perspective Study (LPS) is an informal collaborative project by mathematics educators from many countries investigating classroom interactions in mathematics classes. The idea for the project stemmed from an informal conversation between David Clarke[3], from Australia, and Christine Keitel, from Germany, whereby they discussed some of the limitations of the Third International Mathematics and Science Study (TIMSS) video study. Among their concerns about the TIMSS data collection methods were its lack of ability to capture student-to-student discussions in the classroom and access students' construal of teacher actions and classroom events. The agreed upon aim of the LPS project was to develop a means of collecting data from the three countries involved in the original TIMSS video study – Germany, Japan and the United States - plus Australia. Yoshinori Shimizu was recruited from Japan, and Joanne Lobato from the US to allow for validity of data collection from those countries. Initial project funding was obtained from the four participating countries. As communication developed regarding the project, the project's scope expanded to include more countries. For example, Sweden expressed an interest in participating and then, through further individual contact and

[3] Data in this section arises from an interview with David Clarke about the project that has been triangulated through a discussion with Christine Keitel.

discussion, the project extended to include Hong Kong, mainland China, Israel and the Philippines.

Participation by the Philippines is particularly interesting for our discussion. Although the Philippines' educators wanted to join the international team, they were concerned about the lack of Philippines funds available to conduct such a study, as well as their ability to participate at the group's international meetings. To encourage participation, other project participants elected to subsidise the Philippines by sending them equipment previously used in the Australian study. In addition, two technicians were sent to train educators to operate the equipment. Further specialised training, in Manila, was provided by the Australian team in conducting the interviews. Finally, Australian funds were used to subsidise the Philippines' participation at the international research team meeting.

Data Handling and Analysis

Project data is generally subjected to three types of analysis:

1. Project-wide analysis - First, a project-wide analysis is conducted in accordance with the mutually agreed upon aims of the project. This analysis is done on group wide categories, such as lesson structure, and is based on Clarke's earlier work in the Negotiation of Meaning project.
2. Subgroup analysis - Second, countries are sub-divided into groups, according to specific interests, and data analysis is performed. Examples of clusters included: Hong Kong and Sweden, who are interested in theories of variation; Germany and South Africa, who focus on social justice; the United States and Sweden, who explore mathematics as a discipline, and Australia and Hong Kong, who are concerned about issues of knowledge generation in the classroom.
3. Individual analysis - Third, individual countries and researchers have the option to perform analysis on their own data in any way they decide.

Some apprehension exists on the part of poorer countries that rich countries, due to their greater resources, may "appropriate" their data by completing analyses more efficiently. To address this concern, the group developed stringent gate-keeping mechanisms to safeguard each country's data from the others. Data from one country can only be used by another with the permission of the first country's group leader. Intended data users are expected to send a draft of any paper making use of the data and intended for publication, to the representative for approval. This ensures the data is not misinterpreted and that it will not have a negative effect.

While different group players have different levels of experience in research, and access to facilities, the project has been a professional learning experience for all participants. More experienced researchers have gained access to wide data sources, and have had their views about classroom teaching and learning, as well as their research methods and processes, challenged. Similarly, less experienced researchers, with limited access to resources, have gained access to international forums and training in research and publishing. In addition, all involved have learned invaluable lessons about the stresses and realities that accompany working in a multi-national and multi-cultural research team. The groups became aware of cultural sensitivities, annoyances, and different means and norms of communication. These were sometimes dealt with by the groups on a case by case basis. In short, team meetings became a venue for significant learning experiences and an on-going forum bringing sensitisation and awareness of political and cultural issues of significance to each research group and country.

LPS Project Critique Within the ADMC Model

What mode of social justice does this collaboration represent? This example illustrates several problems that may arise during collaborations among academics with varied interests, backgrounds and cultures, as well as experience in research and access to resources. In order for this global collaboration project to include less affluent cultures, sharing of financial burdens was a prerequisite to collaboration. Hence, part of the project can be classified under the *Aid* mode. However, the project also contained elements of the *Development* mode for researchers from less experienced countries. Arguably, the contributions different researchers made were not equal because the initial model for gathering and analysing the data was driven by the more affluent countries. However, experienced researchers from more affluent countries also experienced professional development as a result of mentoring developing countries. They gained knowledge and appreciation of different research and mathematics teaching traditions. Such collaborations reflect the *Multicultural* mode. Finally, one can also argue that the project reveals certain elements of *Critical Collaboration* in its dealing with safeguards against possible data "appropriation" by the richer countries.

Through the Critical Collaboration lens on this project, one can argue that the research questions posed and procedures followed represent the more affluent countries' interests. As Atweh and Ragusa (2003) reported, issues about globalisation of the discipline, arising from a focus group with leading academics in the Philippines, reveal concerns that Filipino researches are "very much influenced by what they see in [international] journals" (p. 10). Research questions are not judged according to their ability to contribute towards improving the practice of teaching in local contexts. Some research pursuits were classified as "trivial topics" (p. 10). Although this comment is not repeated here with reference to the LPS project discussed here, we argue critical collaboration necessarily includes questioning the relevance that research holds for addressing case specific needs and realities exhibited in different sociocultural contexts.

Case Study 2: Ethnomathematics Movement

Current literature in mathematics education problematises viewing mathematics as a universal discipline. While constructivism (Ernest, 1994) has dealt with individual construction of knowledge, anthropologically informed research has questioned the universality of mathematics from a cultural perspective. Whereas Eurocentric, Western models posit local and culturally-contingent knowledges and practices of mathematics, often performed by indigenous social groups, as "deficit" in comparison to dominant mathematical paradigms, "ethnomathematics" celebrates and highlights alternative mathematical forms, including those practices developed by un/under-privileged socioeconomic groups. Ethno-mathematicians have problematised the international acceptance and status of mathematics resulting from Eurocentrism and colonialisation (D'Ambrosio, 1999; Powell & Frankenstein, 1997).

The popularisation of ethnomathematics is often attributed to the keynote address given by Ubiratan D'Ambrosio (1985) in Adelaide, Australia, in 1984. Since 1984, the concept of ethnomathematics has gained international consideration with significant contributions from Brazil, Africa, New Zealand, and North America. In 1985, an International Study Group on Ethnomathematics was established, replete with website, newsletter and meetings. Although ethnomathematics has arguably become a global movement in approaching mathematics education (Gerdes, 1994), it fails to be universally accepted. Arguably, this illustrates the difference between globalisation of a concept and

universalisation. Ethnomathematics has received a certain amount of critique. Dowling (1998) observed nearly all research and writing in mathematics education comes from researchers within cultural groups who identified with the dominant "Western" mathematics tradition. These "external" researchers have looked at the practices of cultural groups different than their own and thus risk seeing the world from their perspective, and not from the "other". Vithal and Skovsmose (1997) argued, while ethnomathematicians have studied the development of mathematics as interactions of power "between" different cultural groups, they have not studied power interactions "within" the different cultural groups. They argue questions of power need to explore and see the mathematics in every day practices of different cultural groups, as well as the effects and changes "outsider" mathematics produces in the lived reality of people on the inside. Questions over how and if ethnomathematics can be used by indigenous persons, or "insiders", to challenge their subordination within and outside particular cultures must be addressed. It is our position that ethnomathematics researchers have a responsibility to demonstrate the implications of their work to keep the practices of ethnomathematics consistent with its critical stance.

Ethnomathematics Critique Within the ADMC Model

One way to do this is to ask "what mode of social justice is reflected in ethnomathematics research?" Clearly, ethnomathematics has contributed to the recognition of a variety of mathematics reflected in the lived experiences of the social groups studied. Still, concerns exist that such research has failed to develop an ability to produce knowledge about people from within. Moreover, the knowledges generated have failed to assist in the transformation of reality, leading not to social change in justice but rather confirmation of the status quo. As traditionally understood, ethnomathematics is situated within the mode *Multiculturalism*. Ethnomathematics recognises, but does not seek to change, cultural variation. The ethnomathematics movement, understood multi-dimensionally, also processes elements of change and *Development*. For example, international ethnomathematics researchers have contributed to the development of novice researchers from developing societies around the world. One indicator is the growing number of doctoral degrees conferred in mathematics worldwide. A second indicator is the type of research questions being explored. Traditionally, international doctoral students trained in Western institutions chose research questions and theories modelled on those expounded by their host institutions. Slowly, this is changing. Ethnomathematics has facilitated shifting one's gaze from global issues to local conditions and social groups. This not only lends visibility to previously unrecognised groups and realities, but also paves the way for the development of *Critical Collaboration* based on other methodologies such as critical ethnography and action research that have agendas based on empowerment rather than mere representation of voice.

In sum, viewed critically and post-structurally, ethnomathematics possesses the potential to be transformative as well as affirmative. Ethnomathematics research can remain within the multicultural mode of social justice, or, it can be understood as a steppingstone in the development of disadvantaged societies or even critical collaboration between mathematics educators around the world.

Conclusions

The discussion above illustrates the possible usefulness of the ADMC model for critically assessing global collaboration. I have constructed a conception of social justice informed by post-structural, feminist and critical theory that is both multidimensional and

transcategorical (Atweh & Ragusa, 2003). Firstly, the consideration in the model of the two dimensions of distribution/recognition and affirmative/transformative has allowed the identification of a multiplicity of factors to reflect on international collaboration in terms of their design, effects and the roles of the participants. The collapse of any single dimension would have implied a lack of differentiation between different types of social justice issues.

Secondly, the discussion of the model as transcategorical, that is, that the different types of social justice are not necessarily disjointed and contradictory, was illustrated by two case studies that simultaneously manifest multiple modes of social justice. Had global collaborations been *a priori* asserted as expressions of, say, *Development*, then we may have underestimated, or not noticed at all, those aspects which affirm current relations and structures. Conversely, had global collaborations been automatically assumed to be a form of *Aid*, then the potentially transformative components of the interactions might have been missed.

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