Shifting the Lens of Inquiry into the Socialisation of Mathematics Teachers: Nature of Value Differences

Wee Tiong Seah
Monash University
<WeeTiong.Seah@education.monash.edu.au>

A prior socio-cultural inquiry into the professional socialisation experience of immigrant teachers of secondary mathematics in Victoria had focussed on their responsive approaches to perceived value differences (Seah, 2003b). By adopting a different angle of a similar lens of inquiry complementarily, through questioning the nature of the value differences perceived, the immigrant teachers' socialisation experiences are contextualised in terms of interactions between cultural values. This paper outlines some of these value differences, and highlights values related to the Victorian mathematics educational culture.

Following an earlier research study on the professional socialisation experiences of eight immigrant teachers of secondary mathematics in Victoria, I had reported the empowering approaches adopted by these immigrant teachers towards negotiating and mediating perceived differences in their respective mathematics classrooms (Seah, 2003b), and also discussed the significant contextual factors guiding the approaches adopted (Seah, 2003a). Prior to their arrival in Victoria, the eight teachers participating in the qualitative study had grown up, studied, and taught in their respective home countries. For many of them, mathematics (and school mathematics) was perceived as a culture-free discipline. There were often expectations that it would be relatively easy to transfer its teaching across classrooms in different countries. The potential for culture-based conflict was thus evident. As one teacher participant, Li Kang (from Malaysia), put it,

> Maths is universal. Worded questions should not be culturally biased, e.g. questions involving cricket, football (Aussie rules) may be biased in favour of Australians or students who play in the sport. How in questions like probability, involving playing cards, if assumed that all students are expected to know what a "pack of cards" are (sic). (LQ A comments)

While the ability of these immigrant teachers to negotiate cultural differences in mathematics and its pedagogy is certainly cause for celebrating their professionalism, contextual constraints and affordances that were identified (discussed in Seah, 2003a) are reminders that the professional socialisation of these teachers is intricately related to their respective interactions with students, colleagues, institutional structures, and the wider community. Just as Lubienski (2003) had argued that educational research promoting only positive aspects of diversity risks compromising research credibility (in that inherent issues and problems confronting marginalised groups may not be addressed), the intention of this paper is to examine the professional socialisation experiences of the immigrant teachers from another angle within the socio-cultural perspective, one which shifts the focus from personal negotiation with the environment to interactional co-construction of realities. By discussing some of the cultural differences which immigrant teachers were perceiving, this paper represents an inquiry into what these differences were really about, in relation to the socio-cultural environment within which the teachers were functioning. This avoids interpreting immigrant teachers' socialisation from a deficit view, and positions their experiences as being products of social interactions and meaning-making.

Cultural Differences as Value Differences

That mathematics as a scientific discipline and as a school subject has been developing against a socio-cultural context is well recognised in (mathematics) educational research (e.g. Bishop, 1990; D'Ambrosio, 1985; Schmidt, McKnight, Valverde, Houang, & Wiley, 1997). On the other hand, discussion of culture (ethnic, occupational, etc) is often intertwined with considerations of values which are embedded within every culture (Jurdak, 1999; McConatha & Schnell, 1995; Rokeach, 1973). Values are desirable qualities which guide the worldview and actions of the individual or organisation embracing them (Seah, 2002). Hofstede's (1997) large-scale, international survey, for example, uniquely defined individual countries within a five-dimensional space structured by five value continua, these being degrees to which *power distance*, *individualism*, *ambition*, *uncertainty avoidance*, and *long-term life orientation* were emphasised. Acknowledging the centrality of values in the ongoing evolution and expression of cultures, the aforementioned study on the socialisation experiences of immigrant teachers of mathematics in Victoria had regarded cultural differences as essentially differences arising from differential emphases of related values. In this light, the immigrant teachers' life experiences in their respective home cultures were regarded as shaping their own personal values, and consequently, their worldview regarding education, mathematics, and mathematics teaching/learning.

Faced with perceived differences in the emphases of aspects of an immigrant teacher's professional practice, "values mediate a human being's inner and outer worlds, and enable us to express our inner selves outwardly in our daily activities" (Hall, 1994, p. 35). Whether these differences in valuing actually exist in any cross-cultural, objective sense is not relevant from the perspective of the teachers' experiences; the potential for dissonance and conflict arose from such perceptions nevertheless. This is especially so in a profession like teaching which is often highly values-charged. Indeed, the emotional aspect of teaching is integral to the quality of a teacher's practice (Hargreaves, 1998).

Immigrant Teachers of Secondary Mathematics in Victoria

A survey of Heads of Mathematics in all state, Catholic and independent secondary schools in Victoria in late 2000 had attracted 159 valid school responses. Amongst teachers of mathematics in these schools were 110 immigrant teachers who had all previously taught in 34 different countries. A third of these teachers, however, had come from the top three source countries, namely, Britain (n=16), Malaysia (n=11), and USA (n=10).

Recognising that home cultures that shape personal value systems need not correspond to source countries (such as the several teachers from Fiji who contrasted their own Indian culture against the indigenous Fijian culture), the immigrant teachers surveyed were categorised into seven broad home culture categories. As shown in Figure 1, immigrant teachers identifying themselves with the Asian culture and its values accounted for more than 37% of all immigrant teachers in the 159 schools.

The survey data also revealed that 58.18% of the immigrant teachers of mathematics were practising in metropolitan Melbourne, although the proportion of immigrant teachers in school mathematics departments was the highest amongst schools located in country Victoria (an average of 7.1%). In terms of school systems, most of the immigrant mathematics teachers were found in state schools (64.55%), followed by Catholic (19.09%) and independent schools (16.36%). From the perspective of proportion of all

mathematics teachers, whilst immigrant teachers were most likely found in state schools (7.3%), their numbers in Catholic schools translated to the least proportion overall (4.9%).

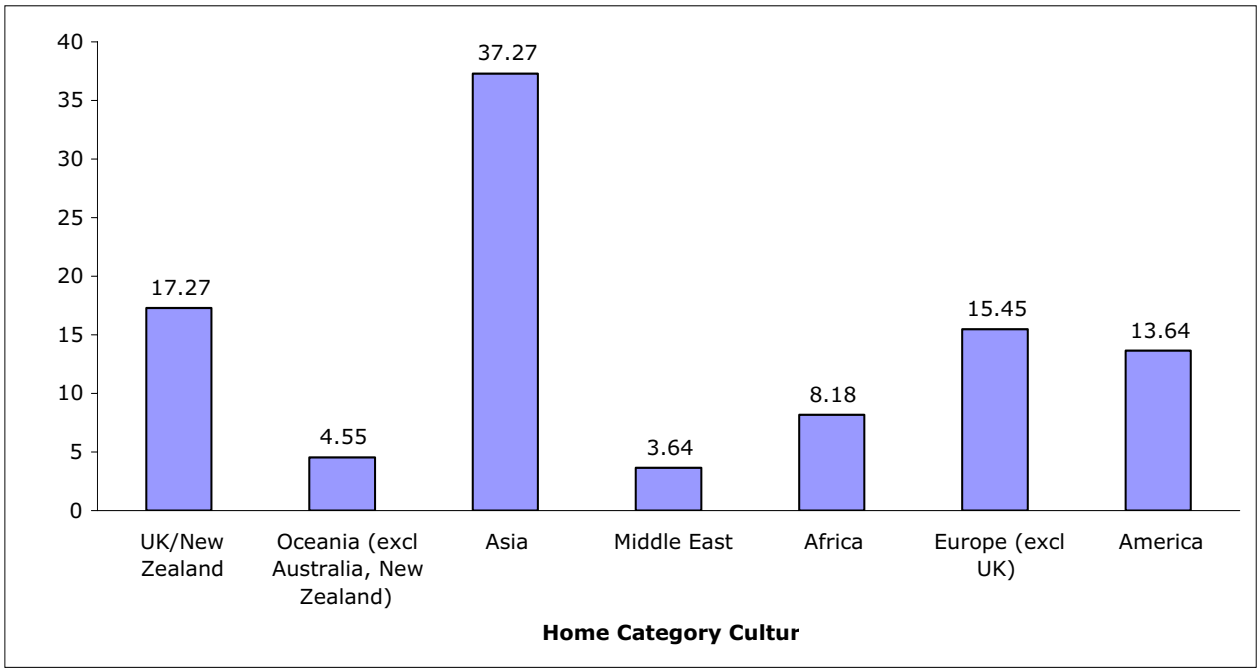

Figure 1. Home culture categories of immigrant teachers of secondary mathematics in Victoria, 2000.

Value Differences Perceived by Immigrant Teachers

Hofstede's (1997) value dimensions had demonstrated the relative nature of value differences. That is, any perception of value difference by no means implies that the home or host culture did not subscribe to particular values. Rather, the difference was often in the extent to which particular values were significant enough within a culture to be enacted upon. Thus, in the study on which this discussion is based, there was Deanne (from Canada) perceiving the Victorian education system as valuing *professional support* less than the Canadian system, whereas Betty's (from England) experience of the Victorian education system was one that emphasised this value more than it was (in her opinion) in England.

The value differences perceived by the teacher participants were reported and discussed through lesson observations, semi-structured interviews, and document analyses (of questionnaires, and teacher assessment of student work). 34 instances of value differences were identified by these immigrant teachers over the data-collection period. From this list of value differences, it was evident that Bishop's (1996) categories of values in the mathematics classroom, namely, mathematical, mathematics educational, and general educational, provided an useful framework with which to categorise the types of value differences perceived. In addition, another category of value differences (organisational) was deemed necessary and appropriate to describe the characteristics of the remaining value differences. A general discussion of these value differences by these categories follows.

Mathematical Value Differences

Mathematical value differences refer to those incidents when there was a possibility or need for the immigrant teacher to portray mathematical values (i.e. values related to the discipline of mathematics) corresponding to the Australian culture, when the teacher's actions may otherwise be guided by mathematical values corresponding to her home culture. Amongst the 34 value differences reported, only one pertained to the nature of mathematics. In other words, across the countries and cultures represented by the immigrant teachers, there appears to be relatively few differences in how the discipline of mathematics was valued. Specifically, the observed mathematical value difference pertained to Deanne's perception of a differential valuing of *precision*. In her view, there was a greater emphasis in the Canadian school system of valuing the *precision* inherent in mathematics, articulated through an expectation for students to use formal, technical language and notations. Interestingly, with regards to her valuing of the precise nature of school mathematics (language), Deanne felt that the Canadian emphasis of the value might be due to the 'old school formula' that underpinned both her school education and the culture of the school system in which she taught. That is, there was the possibility that the focus on *precision* of mathematics might have become weaker in Canada as well.

Thus, it appeared that values related to the mathematics that the teacher participants knew in their respective home cultures were no different from the values that were inherent in the discipline of mathematics in Australia. It was as though the discipline was a constant and coherent entity across cultural borders. This phenomenon had been observed despite extensive literature evidence of the socio-cultural nature of the development of mathematics (e.g. Bishop, 1990; D'Ambrosio, 1985), which emphasised the different mathematic*s*e*s* that had developed in different cultures as these cultures confronted their own needs and made sense of the environment within which they were situated. Indeed, the immigrant teachers' experience and the ethnomathematics movement (D'Ambrosio, 1985) seem to indicate the presence of a pan-cultural mathematics that presented itself in all cultures, ethnic or otherwise. That different ethnic cultures had contributed to the development of "real" mathematics (Bishop, 1990) also reinforces the view of a pan-cultural mathematics, what Bishop (1988) had referred to as M (against m for the ethnomathematical knowledge). The ongoing contribution to this form of knowledge by mathematicians from different cultures today suggests that this M continues to develop independently of cultures. However, this is not to imply that M is culture-neutral. It has its own set of mathematical values (such as the three complementary pairs identified by Bishop (1988)), and it may well be that the preservation or development of these values are being regulated by gate-keepers such as mathematicians, possibly in the form of prominent voices at academic mathematics conferences debating the relevance or validity of emerging mathematical theorems or proofs. These may also be in the form of authoritative pens of the editorial boards of academic mathematics journals. There are also the referees and sponsoring corporations for mathematics research funding agencies, which signals ideological or commercial implications. On the other hand, the relative affluence of Western funding agencies has meant the possibility of this pan-cultural mathematics being identified with Western mathematics in the society.

This is thus possibly the scientific discipline of mathematics that had been introduced to different parts of the world, either through its association with the Western civilisation, through the political, commercial or intellectual colonists past and present, or through international educational aid projects. In so doing, there is a perception that there is one "real" mathematics, and the different ethnomathematics is somehow regarded as relatively

primitive and thus marginalised. This "real" mathematics belongs to the category of hard sciences, free from the subjectivities that may be characteristic of social sciences such as the languages, history, and geography. In turn, students of school mathematics, and thus the general population, acquire an internally-consistent set of mathematical values, which is immune to cultural differences when an individual functions across cultural borders, as the eight teacher participants' professional socialisation experiences demonstrated.

Mathematics Educational Value Differences

The category of mathematics educational value differences was most commonly reported by the teacher participants. These were mathematics educational in nature, where the awareness of difference and the potential for dissonance arose from perceptions of different ways of mathematics teaching and different views of mathematics learning.

How mathematics teaching/learning was valued differently in different cultures was observed to express itself in different aspects of the curriculum, that is, intended, implemented and attained. In terms of the intended curriculum, there were instances when immigrant teachers reported value differences between the curriculum frameworks of their respective home cultures and Victoria's Curriculum and Standards Framework (CSF). For example, in the value difference relating to *conceptual understanding* that was perceived by Rana (from India), she noted how this value was more emphasised in India through the inclusion of formal proof in the Indian curriculum statements, whereas this was apparently not as emphasised in the CSF. Value differences were also observed in the implemented curriculum, such as in Manoj's observation that similar mathematics content might be delivered in Fiji in ways which were more teacher-centred than in Victoria.

At this level of the implemented curriculum, it was striking to note that multiple immigrant teachers had reported two values that were seen to be emphasised more in the Victorian mathematics educational culture. In particular, these values were *technology* and *numeracy*. Indeed, these may be regarded as the defining features of the Victorian mathematics curriculum. In terms of the valuing of *technology*,

> a key reason for this … relates to values and beliefs about mathematics: mathematics at school should be like mathematics as used outside school. As mathematics outside school changes and the methods of choice change, so also should the methods of choice at school change, to the extent that this is reasonably possible. (Leigh-Lancaster, 2000, p. 10)

In valuing *numeracy*, students in Victoria were expected to "acquire numeracy skills that enable them to use mathematics sensibly and confidently in a variety of different situations" (Board of Studies, 2000, p. 8). As such, the Victorian mathematics curriculum emphasises application of mathematical knowledge and skills to problems that might be encountered in everyday lives.

Aspects of the attained curriculum might also be valued differently in different educational cultures. Student learning, for example, appeared to be evaluated in different ways, thereby demonstrating different values relating to assessment (as aspect of the attained curriculum). Deanne's reflection of her teaching experience in Canada revealed a focus on formal examinations and tests as a means of assessing student learning. In Victoria, however, she had noticed a valuing of *alternative assessment*, in which student progress was evaluated through such means as extended projects and teacher observations.

General Educational Value Differences

Value differences which were related to general educational aims were also reported by the immigrant teachers. General educational values are those culturally-referenced values pertaining to desired objectives which school education aims to inculcate in students, which might include *empathy*, *honesty* and *responsibility*, for examples.

Amongst the reported differences related to general educational values, it was significant that half of them were experienced by multiple teacher participants. Specifically, *power distance* was observed to be valued differently in Australia by Carla (Romania) and Deanne (Canada), while *respect* appeared to Manoj (Fiji) and Khaliq (Lebanon) to be valued differently in Australia. Notably, the relative emphases of these in Victoria were similar across teacher participants, even though the teachers involved had come from a diverse range of cultures. That is, the mathematics classroom in Victoria, and by extension, the Australian society appeared to these teachers to be valuing *power distance* or *respect* less than in their respective home cultures. In fact, Australia's position on Hofstede's (1997) *power distance* dimension was amongst the lowest amongst the 53 cultures surveyed.

Deanne's experience with Canadian mathematics textbooks, and her perception that the Australian mathematics textbooks did not appear to explicitly promote *diversity,* were significant, given that both Australia and Canada are amongst the most multicultural societies in the world. According to Deanne, typically in a Canadian mathematics textbook,

> you often see people of different nationalities … whereas in the Australian books, there is very strong 'John', 'Tim' and 'Sarah'. You will come across all sorts of names and things [in Canadian textbooks], which I think is a very good thing which we are lacking here [in Australia] …. (Referring to a particular question in a Canadian textbook) And here we have 'Takzan has three times as much as Paul'. We are not going to see that in an Australian book …. You think there is a very strong Aboriginal community in Australia, and yet you don't see a lot of Aboriginal names up in our textbooks, which is a shame. (DP3: 1-4, 9-10, 89-91)

Organisational Value Differences

This study has also found that the values underlying perceived differences were not always rooted in the discourse of the mathematics classroom. Values which were emphasised at the organisational level (such as school administrative values) could be brought to bear in the context of the immigrant teachers' decisions and actions in the classroom, resulting in the perception of value differences. The source of these organisational values may be evident if educational systems are regarded as social institutions, which traditionally embody the values and norms of the very people who design and structure them (Bruner, 1996) – politicians, and to a certain extent, stakeholders such as educational boards (for example, in Victoria, the Victorian Curriculum and Assessment Authority) as well as the relevant professional associations and unions. In fact, they

> specify more concretely what roles people play and what status and respect these are accorded — though the culture at large expresses its way of life through institutions as well. (Bruner, 1996, p. 29)

Specifically, the organisational value differences reported by the immigrant teachers related to differences in the valuing of *support* for teachers, although the nature of support in each case was different. For Deanne, this was about a perceived lower level of emphasis on *professional support* in the Australian mathematics classroom, relating to teaching

resources such as textbooks and professional journals, as well as to the different ways in which department meetings were conducted in Victoria and in Canada (relatively more professionally developmental in Victoria, and more administrative in Canada). On the other hand, for Betty, she noticed a relatively greater emphasis in Australia of *administrative support* for teachers. In England, the myriad of administrative tasks had made it difficult for Betty to see the "big picture" of mathematics teaching/learning. The valuing of *administrative support* in Victoria, however, had given her opportunities to regularly evaluate her own practice.

Conclusion

This study has demonstrated that culturally-based value differences could be experienced by immigrant teachers in secondary mathematics classrooms in Victoria regardless of their home cultures, and also, regardless of their years of experience teaching in Victoria. Whilst it was the first year of teaching in Victoria for Saka (from Ghana), Manoj had been doing so for 27 years. There was no evidence in this study that length of service might be a measure of an immigrant teacher's disposition or sensitivity to perceive value differences during their practice. However, it did appear that the opportunities provided by length of service in Victoria had probably helped immigrant teachers to hone their responsive approaches to perceived value differences. The certainty and confidence with which Manoj dealt with value differences was likely the manifestation of 27 years of mathematics teaching experience in Victoria. On the other hand, immigrant teachers who were adept at negotiating value differences needed not be "veteran immigrants"; Deanne was such an example, having taught for only 6 years in Victoria.

By shifting the lens of inquiry from examining immigrant teachers' negotiation of perceived value differences to exploring the nature of these differences, it has been found that central to such differences were differential emphases of values related to mathematics, mathematics education, education in general, and organisation. The discussion in the last section provided only outlines of some of these value differences. That these were socio-culturally constructed further highlights the fact that the immigrant teachers' socialisation experiences had not merely been personal efforts to interpret and mediate perceived differences. What was perceived to be an Australian value was certainly not a static, fixed characteristic of the culture in Victoria. Rather, just as a culture's values evolve as it itself develops in time, the focus on the nature of the perceived value differences had highlighted the co-construction of the socialisation experience by the environment and the actors within this environment. This perspective to the immigrant teachers' experiences complements an alternative one, which attributes the agency on the individual teacher, such as researching the personal value system (Seah, 2003a). In addition to celebrating the empowerment experienced by immigrant teachers in negotiating value differences, this different angle of the socio-cultural perspective brings to sharper focus how cultural interactions affect the quality of immigrant teachers' socialisation, rather than just these teachers' abilities to construct their professional realities in Victoria.

This does not represent a shift from a "blame the victim" view to one of "blame the environment". The greater understanding of the immigrant teachers' socialisation process which this different angle of inquiry affords potentially provides opportunities for the structuring of even more meaningful induction or in-service programs to empower immigrant teachers further to mediate value differences. Such programs are more than just about approaches to negotiating value differences. They are also about facilitating immigrant teachers' understanding of the Australian culture in general, and Victorian

educational culture in particular, in order to better interpret value differences. Furthermore, a recognition of our role in shaping the realities of immigrant teachers can also deepen our understanding of our Australian values. For example, Deanne's observation that mathematics textbooks in Victoria were Anglo-centric in its content provided opportunities for re-examination of Australia's expression of her valuing of *diversity*.

Australia's aging population and a shortage of teachers of mathematics (both within Victoria and globally) are likely to increase existing pressure on the supply of qualified and competent mathematics teachers in Victoria secondary schools. Whilst a carefully-targeted immigration program may be part of a multi-pronged strategy to attract more mathematics teachers, this needs to be complemented by professional induction and in-service opportunities aimed at retaining these immigrant teachers within the system. By shifting our lens of inquiry to focus on the nature of the perceived value differences, it becomes more evident that a successful socialisation experience is as much determined by how the immigrant teachers mediate the differences as it is by the nature of the Australian culture in interaction with other cultures.

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