NEGOTIATING ABOUT PERCEIVED VALUE DIFFERENCES IN MATHEMATICS TEACHING: THE CASE OF IMMIGRANT TEACHERS IN AUSTRALIA

Wee Tiong Seah
Monash University, Australia

This paper reports on a qualitative research study exploring the socialisation experiences of immigrant secondary mathematics teachers practising in Australia. Teacher perception of differences in the ways their respective home and the Australian (host) cultures value aspects of mathematics teaching and learning was observed to lead to dissonance. Their negotiation about these differences highlighted the role played by personally-held values. Although each teacher participant adopts different approaches to mediate the different perceived value differences, the inclusive approaches of amalgamation and appropriation were most widely adopted. Implications towards optimising mathematics pedagogy, and towards meaningful professional support for mathematics teachers in transition, are suggested.

> I strongly believe that Maths is Maths in any culture. I teach Maths my own way, with a great passion and commitment to the students I teach. (Carla, immigrant teacher from Romania)

INTRODUCTION

We live at a time of ever increasing contact and communication across geopolitical boundaries. While the fight against terrorism involves many nations, air travel continues to enjoy increasing growth. As the 2004 Asian tsunami disaster demonstrated nature's ability to unleash its force across countries, affecting the lives of people in even more nations, the coordination and success of the international relief aid effort highlighted the role of cross-cultural communication. Transnational migration continues to be a global phenomenon, and this includes the increase in demographic movement of teachers of mathematics around the world, either directly as a result of responding to mathematics teacher shortage in local schools, or indirectly due to one's family making the move to another country.

It is reasonable to suppose that teachers of mathematics may be less concerned than their colleagues of other subjects to teach in a different country. As the quote above demonstrates, (school) mathematics is often regarded as culture-independent. After all, topics such as the arithmetic operations and Pythagoras' Theorem remain the same in different cultures and these same topics are taught in these different cultures. However, when teachers facilitate the learning process of these supposedly culture-independent topics in mathematics classrooms in different cultures, surely the pedagogy is culture-dependent? For example, a mathematics teacher used to teaching in a teacher-centred manner in her home culture is likely to find it different – even difficult – to teach similar topics in a relatively student-centred learning environment.

2005. In Chick, H. L. & Vincent, J. L. (Eds.). *Proceedings of the 29th Conference of the International Group for the Psychology of Mathematics Education*, Vol. 4, pp. 145-152. Melbourne: PME.

In other words, mathematics pedagogy may actually be as culture-dependent as any other school subject. Yet, perhaps because of the belief that school mathematics is culture-independent, educational research into the pedagogical process and professional experiences related to mathematics teaching across cultures is at best scarce.

It is within this context that the study reported in this paper is positioned. In particular, the study inquires into the professional socialisation (Su, Goldstein, Suzuki, & Kim, 1997) of immigrant teachers of mathematics practising in secondary schools in Victoria, Australia, and explores how these teachers negotiate any cultural difference they encounter in teaching and facilitating the learning of school mathematics. This paper will briefly position the construct of values as providing an appropriate framework to examine the socialisation experience of the immigrant teachers. An outline of the research methodology follows, before a summary of the findings is presented. The range of responses adopted by the teacher participants will also be discussed.

THE VALUE-LADENNESS OF (MATHEMATICS) EDUCATION

This study adopts the stance of social-cultural constructivism, acknowledging the development of mathematical knowledge as socialised knowledge, including ethnomathematics (Bishop, 1991; D'Ambrosio, 1985; Knijnik, 1993), and also recognising the socio-cultural context of mathematics teaching and learning in schools (Bishop, 1994; Schmidt, McKnight, Valverde, Houang, & Wiley, 1997). While the consideration of factors such as ethnicity, socio-economic levels and gender in mathematics education research has traditionally reflected the socio-cultural aspect of facilitating school mathematics teaching and learning, this study explores the professional practice of immigrant mathematics teachers using another socio-cultural variable, that is, values.

After all, the very act of educating is by nature value-laden (Gudmundsdottir, 1990). Teachers do — and are expected to — show the values that they themselves embrace (Veugelers & Kat, 2000). In this regard, immigrant teachers bring to the host culture their cultural 'funds of knowledge' (Moll, 1994) pertaining to content and pedagogy, which may be different from the corresponding dominant attitudes, beliefs and values in the host culture. Further, it is hard to discuss cultures and cultural differences without considering the values which constitute the shared meanings understood within groupings of individuals (Hofstede, 2001; Kluckhohn, 1962). Therefore, for immigrant mathematics teachers practising in Australia, the experiencing in the Australian classroom of value differences and the resultant dissonance are inevitable.

VALUES RELATED TO SCHOOL MATHEMATICS EDUCATION

Values related to school mathematics education may be regarded as representing

> an individual's internalisation, 'cognitisation' and decontextualisation of affective constructs (such as beliefs and attitudes) in his/her socio-cultural context. Values related to mathematics education are inculcated through the nature of mathematics, through the

> individual's experience in the socio-cultural environment and in the mathematics classroom. These values form part of the individual's personal value system, which equips him/her with cognitive and affective lenses to shape and modify his/her way of perceiving and interpreting the world, and to guide his/her choice of course of action. They also influence the development of other affective constructs related to mathematics education and to life. (Seah, 2003b)

Bishop (1996) had earlier categorised these values as mathematical, mathematics educational, and general educational. In particular, Bishop (1988) also conceptualised three pairs of complementary mathematical values, being *rationalism* and *objectism*, *control* and *progress*, *openness* and *mystery*. On the other hand, mathematics pedagogy in different classrooms emphasise values such as *technology*, *practice*, and *problem-solving* to differing degrees. At the same time, there are also the general educational values which are espoused in mathematics classrooms differently, examples of which include *neatness*, *creativity*, and *honesty*.

As depicted in the affective taxonomy of educational objectives (Krathwohl, Bloom, & Masia, 1964), values arise from the increasing internalisation of what Raths, Harmin, and Simon (1987) called 'value indicators', which include beliefs and attitudes. Whereas beliefs often deal with truth/falsity (Kluckhohn, 1962) and are thus often expressed in context (e.g., 'All students can achieve good mathematics results'), values tend to be concerned with what is desirable or not (Rokeach, 1973). Thus, values are often expressed as single terms and context-independent. As alluded to in the definition of values above, in the affective taxonomy of educational objectives (Krathwohl et al., 1964), and in Raths et al.'s (1987) valuing process, the acquisition of values is a cognitive process. Even if the arousal of values in an individual may be an affective, emotional response to environmental stimuli, the notion of competing/conflicting values (Hofstede, 1997; Lewis-Shaw, 2001) implies that the act of valuing involves choice and decision-making; that is, the emphasis of values is in itself cognitive.

In this light, what are some of the culturally-based differences in values related to mathematics, mathematics pedagogy and education which immigrant mathematics teachers find in the Australian classroom? More importantly, in the interest of retaining valuable professional resources, and of empowering them to optimise the mathematics learning experience of all students, how do immigrant teachers negotiate about the value differences *they* perceive in the Australian mathematics classroom? What are some of the environmental factors which facilitate or constrain the espousal of particular values in conflict?

CONDUCTING THE STUDY

As a research study which seeks to understand and to generate theory, rather than to test any hypothesis, it is essentially qualitative (Merriam, 1988) in approach. Purposive sampling (Merriam, 1988) from a larger pool of immigrant mathematics teachers (identified earlier through a state-wide postal survey of all secondary schools) had helped to identify eight teacher participants representing the different

education systems, both gender, professional placement across different parts of Victoria, and a diverse range of home cultures.

The research method involved the analysis of data collected through semi-structured interviews, lesson observations, and questionnaires and teacher marking of student work. Questions arising from the research questions were cross-referenced across the different data sources so as to achieve triangulation and to enhance validity of findings. Details of the research methodology employed in the study are discussed in an earlier paper (Seah, 2003a).

FINDINGS

The 34 reported differences in cultural values as perceived by the eight teacher participants in their respective secondary mathematics classrooms related not only to mathematics as a scientific discipline, to mathematics pedagogy, to educational aims, but also to differences in the ways in which educational institutions adopt organisational values. In particular, two immigrant teachers (Deanne from Canada, and Betty from England) perceived the valuing of *professional support* and *administrative support* to be emphasised differently in their Australian workplaces.

It is perhaps not surprising from the ensuing discussion that more than half of the perceived value differences were mathematics educational in nature. Interestingly, although value difference is regarded as relative (Hofstede, 1997) across cultures, none of the eight foreign cultures appeared to emphasise the values of *technology* and *numeracy* more than the Victorian mathematics curriculum.

Current knowledge from human resource management (e.g., Hofstede's (1997) 'acculturation curve') suggests that the state of stability is eventually attained after a period of uncertainty and dissonance in cross-cultural transition. There was no evidence in this study, however, that this holds for (mathematics) teaching. Manoj, an immigrant teacher from Fiji who has had 27 years of teaching experience in Australia, continued to perceive value differences during his practice. Analysed data indicated that this is likely because the very nature of students, institution and society change in time, perhaps more frequently and/or more deep-rooted than in the commercial workplace! However, years of experience did help Manoj hone his ability and consolidate his confidence in responding to dissonance brought about by value differences.

Confronted by the perceived value differences, each of the immigrant teachers was observed to adopt a variety of responsive approaches. That is, no one immigrant teacher negotiated about perceived differences in just any one particular way. These approaches are summarised in Table 1, the framework of which was adapted from Bishop (1994).

The observation of the affinity response indicates that perceived value differences need not always lead to dissonance. For example, Betty found that some of the values that were operating in Australia resonated with what she personally embraced, values

which were not as valued in the British mathematics classroom. As such, she felt a sense of affinity to these relatively 'Australian' values, namely *application* and *administrative support*.

Culture to which personal value is aligned	Response	Assumption	Teaching
Australian culture	Affinity	There is no culture conflict; my value is aligned with the Australian culture.	The Australian culture supports my mathematics teaching style.
Home culture	Status quo	My home culture should be espoused.	I teach mathematics in the same way I did in my home culture.
	Assimilation	The Australian culture should influence the surface characteristics of my mathematics teaching.	I include the Australian cultural contexts in my teaching, such as in examples and problem sums.
	Accommodation	The Australian culture should be espoused.	Planning and classroom decisions portray the Australian culture.
	Amalgamation	The essence of my home culture and the Australian culture should guide mathematics teaching.	My teaching reflects a synthesis of teaching styles from my home culture and from Australia.
	Appropriation	My home culture and the Australian culture should interact to inform my mathematics teaching.	My mathematics teaching style consistently reflects an adaptation of my home culture to local norms and practices.

Table 1: Responses by immigrant teachers to perceived value differences in mathematics education.

Not all perceived value differences appeared to be mediated successfully by the immigrant teachers, however. For instance, although Carla (an immigrant teacher from Romania) found herself capable of accommodating (see Table 1) to a lesser emphasis of *power distance* in her Australian mathematics classroom, in some cases she appeared helpless and did not know how to respond to the value difference situation.

Thus, attending to the various contextual factors operating at the time when the value differences were perceived had meant the consideration of how the values underlying each of these factors might interact with the values that were already seen to be in conflict. For example, in Rana's perception that *product* was valued more by her students in Australia, and *process* embraced more by her students in India, her responsive approach took into account several contextual factors, such as the nature of work in Australia, student self-esteem, and the relatively heavy teaching schedule in her Australian workplace. Each of these implied that Rana's negotiation involved more than a choice between the valuing of *process* or *product*, to an interplay of values underlying the various contextual factors. Again, the role played by the teacher's personal values in the negotiation of perceived value differences is a significant one.

COMPLEMENTARITY OF VALUES THROUGH THE AMALGAMATION AND APPROPRIATION APPROACHES

Interestingly, however, each and every one of the teacher participants was observed to adopt the amalgamation and/or appropriation approaches. This is noteworthy because these two approaches differ from the affinity, status quo, assimilation and accommodation approaches, in that instead of the values of either the home or Australian cultures being affirmed through the teachers' response, amalgamation and appropriation combine aspects of both these cultures in ways which also re-establish the harmony and equilibrium within the particular teacher's personal value schema. In this way, they may be perceived as being inclusive responsive approaches: approaches characterised by the inclusion, embracing, and mutual support of values from different cultures. On the other hand, the other four approaches may be called exclusive responsive approaches as some values tend to be excluded in the process.

Through this expression of a 'middle way', these inclusive responsive approaches serve to enrich both the home and Australian cultures. In the case of amalgamation, this 'middle way' enables the concurrent emphasis of both cultures' values as they are. Analogically, this is similar to the chemical formation of mixtures (versus compounds): the constituents of the mixture remain distinguishable and separable although they together have produced something new. For example, Betty's response to a relatively higher emphasis of *technology* in the Australian mathematics classroom when she originally subscribed to paper-and-pencil and mental *computations* embraced in the British mathematics classroom (in her opinion), was one of amalgamating the different values: encouraging mental computation for simpler questions and responsible use of technology in more tedious calculations.

On the other hand, in the case of appropriation, the relevant home and Australian cultures are seen to have interacted with each other and redefined each other, such that their individual nature has transformed in the process. Using the analogy of chemical formations again, this approach is akin to the production of compounds: while the properties of the constituents may be distinguishable in the nature of the compound, it would be impossible scientifically to isolate the constituents from it.

For example, when Manoj grew to understand the relative lack of connection between academic performance and personal success in the Australian society (when compared to his Fiji Indian culture), his approach to negotiating the cultures' difference in the valuing of *academic achievement* was one of appropriating it to adapt its relevance in his Australian classroom. While he continued to value *academic achievement*, he no longer expected this to be embodied in the form of absolute assessment scores. Rather, its importance became one of each student performing to her best potential.

Since the balance of emphasis between values changes with each classroom situation, appropriation is an ongoing process as the individual continually assesses how the conflicting values interact with each other in the different situations.

CONCLUSION

This paper has briefly reported on some of the findings relating to immigrant teachers' negotiation of perceived value differences in the Australian mathematics classroom. In mediating the dissonance, the immigrant teachers re-established harmony and equilibrium within the personal value schemas. Although this has led to the adoption of a range of responsive approaches (listed in Table 1), the inclusive approaches of amalgamation and appropriation were by far most commonly used.

This researching process has highlighted how the mathematics learning discourse in the classroom is indeed value-rich. There is thus a need for this aspect of mathematics education to be further researched upon, both for reasons of optimising school mathematics teaching and learning process, and of highlighting the role that mathematics education can – and does – play in the wider good of values education.

The socialisation experience of immigrant teachers can possibly inform similar experiences of mathematics teacher in transition between other kinds of cultures (e.g. public and private schools). This study has shown that successful socialisation does not imply teacher enculturation into the host culture. Neither does it involve ways of preserving the teachers' respective home cultures per se. Rather, an empowering professional development program should focus on enabling teachers to explore the values negotiation in relation to their own personal values. Importantly, this has the potential of developing mathematics teachers' cultural intelligence (CQ), at a time when an individual's capability to complement it with her intelligence quotient (IQ) and emotional intelligence (EQ) is most crucial for personal and professional health and growth.

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