Concluding remarks

My impressions of ICME are not detached from those of the host city and the social events, official and unofficial. On these counts we were very fortunate On the first evening we were treated to a spectacular show at the Congress Centre by the beautiful dancers of the Andalusian Dance Company There were several exhibitions in town related to the Congress, one with an interesting collection of old mathematics texts and calculating machines Sevilla and its environs lived up to their reputation (including that of being hot — the temperature showed 51°C in the sun one afternoon). The Alcázar more than compensated those of us who did not manage the trip to the Alhambra — built in the same Mudejar style, the patterns made me recall the recent talk by M Escher's son to the Canadian Mathematics Study Group, when he remarked how inspired his father was by his visits to the Alhambra; the Giralda and cathedral; the elegant gardens of María Luisa Park; Triana, the gypsy quarters on the banks of the Guadalquivir; and the celebrations of the Festival of St Anne which started as the Congress was coming to an end. In Córdoba, there was the Mezquita with its spectacular white and red double arches and its mirhab; the old Jewish quarters of Córdoba and Sevilla; I could just go on. I must also mention the warmth of the Spanish participants who were so keen to show us around and initiate us into the Spanish tradition of sampling wines, sherries, and tapas at different bars. And while ICME seemed at times too big and overwhelming, there were occasions when I would find myself sitting with just a few old/new acquaintances, in some bar, exchanging views about the conference, about our work, about future plans, late into the night, and suddenly it was all worth it.

ICME 9 will be held outside Tokyo in four years time Will I be there? Maybe

Some reflections about reflection and ICME 8

BARBARA JAWORSKI

My working group (WG26) was probably the most significant part of my Congress. It was well-designed, well-organised, and well-chaired. Its theme was "Connections between research and practice in mathematics education". There was a balance between presentation of papers and group discussion, and between English and Spanish. The group leader, very sensitively, translated where necessary and possible, and there seemed to be an atmosphere of inclusion for members of the group This is my story, however, as an English speaker and one of the people who presented a paper. I wonder if the Spanish speakers and the non-presenters also felt "included"? This seems an important issue for conference organisers and group leaders to address.

In our discussion about research and practice it became important to address the "who" question: *Whose* research and *whose* practice is it? Invariably this led to a questioning of what actually we mean by research.

Research might be seen as a process through which theory grows and knowledge is enhanced. In the case of educational knowledge and research, what can we say about its nature and purpose? Perhaps that nature includes the substance and processes of practice, and that purpose includes informing or enhancing practice. But, of course, practice is the everyday work of practitioners, so informing and enhancing practice must have something to do with the ways in which we operate in our work as learners, teachers, teacher-educators, researchers, or whatever.

It struck me that when we (a community of educators) talk about influencing practice in mathematics education, we are drawn to images of classrooms and teachers, and the enhancing of the learning experience for mathematical learners: i.e. seeking better teaching. So research slips into being about developing knowledge of processes of learning and teaching — to enable teachers to do a better job. Cynically, we recognise attitudes of, "If only teachers paid attention to the research which has been done ...". We are all aware of the amount of research which sits on shelves in libraries and has no connections at all with practice in classrooms This research is manifestly not informing or enhancing practice. It might even be detrimetal to its own aspirations as it gets a bad press with teachers who regard it as irrelevant to their practice and who thus become antipathetic to its messages if ever these penetrate school walls

In practice, educational development often adopts a model of those-who-know doing something to those who-don't This has been shown mainly not to be successful and is partly responsible for research ending up on library shelves.

The mood of the Group seemed to support the importance of bringing research closer to practice; perhaps that teachers themselves should be involved in the research, an empowering process which raises issues which have a direct connection to classroom practice This raised questions related to practitioner research: to what extent it might be classified as research; how it might be related to reflective practice; how teachers might be supported in doing research; whether such research would increase knowledge; where the theory resides in such research In fact we recognised that the results of practitioner research are often regarded as unrigorous and ungeneralisable, therefore it is seen as not increasing theory or knowledge.

I played a strong part myself in some of this discussion, but afterwards stopped to question our presumption in discussing what might be best for (other) teachers. The people who make statements or decisions about this, and indeed who urge teachers to get involved in research and reflective practice, are often teacher-educators, or researchers, from higher education. As teachers ourselves, how do we feel about such presumption and do we practice what we seem to preach? One might ask how many of us do research on our own practice, or enhance practice through critical reflection. How questioning are we of the success of our delivery of academic courses in terms of the growth of knowledge and effective practice in teaching?

In reflecting on these discussions and developing my own thinking as a result, I was reminded of a number of recent events, or concerns, which seemed to have a bearing on

issues arising (for me) in this working group. For example:

1) A PME (Psychology of Mathematics Education Group) presentation by Laurinda Brown gave an account of her use of a methodology of offering "stories" as a basis for encouraging student teachers' reflection on significant aspects of their practice;
2) An ICME 8 lecture by Tom Cooney talked about approaches to teacher education and, in particular, activities which he and his colleagues had developed to enable prospective teachers to reflect on the processes of teaching and learning.
3) Evaluation reports from a one-year teacher education course at my own university, partially taught by me, said there was too much emphasis on reflection, and that it was boring and unproductive;
4) An issue which niggles at me constantly in my professional life is my own development as a teacher-educator and researcher, and how reflection influences my own practice.

If my students are unappreciative of my efforts to get them to reflect (3), then either reflection actually isn't of use to them, or I am being ineffective in the way I work with the students. It might be that I am not seen to be effective myself as a reflective practitioner (4). As I reflect on these students' evaluations, how is this reflection going to influence the way I work in next year's course? Is it legitimate for this overt reflection to be regarded as research?

Laurinda offered a methodology to aid reflection. Tom offered activities on which to reflect. In both cases I was aware of similarities and differences between the practices described and the ways in which I work myself. This raises important issues for teaching. The main value of these sessions seemed to be to alert me to activities and processes I might employ, and reinvigorate me towards using them. How might I best research the process of their use? Would this be more fruitful if I drew my students into this thinking and encouraged them to help me evaluate effectiveness? Perhaps student's overt involvement at this level might make for a more collaboratively reflective venture. How might I turn these reflective questions into positive action for the enhancement of my teaching?

I observe now that I am focusing on my own local development of expertise and its potential influence. What does this have to do with more global developments in education — perhaps worldwide? There is a tension, maybe a productive one, between seeing educational development locally and globally. Is the latter merely the sum of all the instances of the former? Somehow I don't think so. From many theoretical perspectives a collaborative approach to global development might seem to have the best chances of success. Here collaboration is meant to be the widest possible, i.e. including students, teachers, educators, researchers, wherever they may be found.

My word limit forbids more extensive deliberation on these questions here. Let me end by coming back to ICME and its role and purpose. Clearly it has played an important role for me in making the above deliberations possible. This is a local influence. What are the more global possibilities? At ICME 3-4,000 people gathered from all over the world. Should not the huge effort and expense of organising the congress result in more than the sum total of all the local illuminations that participants achieve?

I am aware that, unlike me, many of my compatriots did not have such a fruitful ICME experience. Maybe they did not choose their sessions well. However, this suggests that some parts of ICME are less valuable than others. Or is this an individual phenomenon: everything will be of value to someone? Again, I don't think so. There seems to be a challenge to ICME participants, and indeed to the organisers of ICMEs, to consider what we want an ICME to be and to offer to all its participants, and what we hope the effects of that might be on the global development of mathematics education.

Nights in the gardens of Spain

JOHN FAUVEL

Sunday

The whole Iberia flight from Heathrow to Seville seems to consist of ICME delegates, recognisable by their blue ICME-7 bags, which have stood up to four years' use remarkably well. Networking starts early, and even before leaving English soil I have several useful conversations with people about future plans and projects. Arriving in Seville with nowhere to stay turns out in retrospect to have been a good move, since the hotel they allocate me, in the centre of Seville a stone's-throw from the Cathedral, is gradually colonised during the week by delegates whose pre-assigned hotels turn out to be located miles from anywhere, at the end of non-existent bus routes.

Monday

Like everyone's rainbow, everyone's ICME is different. The opening day provides an opportunity to use experience of earlier congresses to work out an optimally fruitful path. This involves the ruthless discarding of events that one knows in advance will not work. My experience of ICME-Laval has determined me never to go to another opening or closing ceremony and associated plenaries. From talking to others later about their experience of this opening day I do not regret my decision.

Tuesday

The heart of a big international conference is the internal message board. To communicate with someone at this conference you take a blank card from a box, write a message on it, put this in another box, which is then opened occasionally by the organisers who transfer it yet to another box and post a computer list of people who have messages. Any delegate bold enough to pin a message to the board for someone else finds it is removed by the organisers. All the messages I leave today are still uncollected by the end of the congress; apart from anything else, the organisers have omitted to create any public awareness of there even being a message board.

The first session for the HPM Study Group (History and Pedagogy of Mathematics Group) is well attended. There are delegates from over 30 countries, from Iceland to Papua New Guinea, a graphic reminder of the extraordinary achievement of ICME in bringing together so many far-